L. Baker

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES

REPORT OF SAMPLE DELIVERY GROUP #0200037

Project: NEUTRON PRODUCTS
Analysis Procedure: Gamma Spectrometry
Date Reported: 09/10/2002

SAMPLES

NAREL Sample #	Client Sample ID	Type	Matrix	Date Collected	Date Received
A2.03832M	NP #12	SAM	SOIL	08/15/2002	08/19/2002
A2.03833N	NP #13	SAM	SOIL	08/15/2002	08/19/2002
A2.03834P	NP #14	SAM	SOIL	08/15/2002	08/19/2002
A2.03835Q	NP #15	SAM	SOIL	08/15/2002	08/19/2002
A2.03836R	NP #16	SAM	SOIL	08/15/2002	08/19/2002
A2.03837T	NP #17	SAM	SOIL	08/15/2002	08/19/2002
A2.03838U	NP #18	SAM	SOIL	08/15/2002	08/19/2002
A2.03839V	NP #19	SAM	SOIL	08/15/2002	08/19/2002
A2.03844R	BKG 03	SAM	SOIL	08/14/2002	08/19/2002
A2.03845T	BKG 04	SAM	SOIL	08/15/2002	08/19/2002

EXCEPTIONS

1. Packaging and Shipping - No problems were observed.
2. Documentation - No problems were observed.
3. Sample Preparation - No problems were encountered.
4. Analysis - No problems were encountered.
5. Holding Times - All holding times were met.

QUALITY CONTROL

1. QC samples - All QC analysis results met NAREL acceptance criteria.
2. Instruments - Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Chief of the Monitoring and Analytical Services Branch and the NAREL Quality Assurance Coordinator, or their designees, as verified by the following signatures.

For James B. Mony 9/12/02

Mary F. Wisdom Date
Quality Assurance Coordinator

Tonya B. Hudson 9/12/02

for John Griggs, Ph.D. Date
Chief, Monitoring and Analytical Services Branch

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Reagent blank

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

EVALUATION OF QC ANALYSES

A reagent blank result is considered unacceptable if it is more than 3 standard deviations below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "*Z* scores." A *Z* score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The *Z* score for a spiked sample is computed by dividing the difference between the measured value and the target value by the combined standard uncertainty of the difference.

The *Z* score for a duplicate analysis is computed by dividing the difference between the two measured values by the combined standard uncertainty of the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measured value and the net concentrations are then converted to total activities before the *Z* score is computed.

Each standard uncertainty used to compute a *Z* score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of reagent blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

GENERAL INFORMATION (CONTINUED)

GAMMA ANALYSIS

The reporting format lists the gamma emitters in alphabetical order. The activity and 2-sigma uncertainty for radionuclides measured by gamma spectroscopy are reported only if the nuclide is detected. Nuclides that are not detected do not appear in the report, with the exception of Ba-140, Co-60, Cs-137, I-131, K-40, Ra-226 and Ra-228. If one of these seven nuclides is undetected, NAREL reports it as "Not Detected" or "ND", and provides a sample-specific estimate of the MDC.

Due to potential spectral interferences and other possible problems associated with the determination of the activity of certain radionuclides, the activities for Th-234, Pa-234m, Ra-226, Th-231, and U-235 are subject to greater possible uncertainty than other commonly reported radionuclides. It should be noted that this potential uncertainty is not included in the two-sigma counting uncertainty which is reported with each activity. Although in this report we do provide the calculated activities for these radionuclides, we recommend that the results be used only as a qualitative means of indicating the presence of these radionuclides and not as a quantitative measure of their concentration. The results for these nuclides are not used in the evaluation of quality control samples. Furthermore, because of mutual interference between Ra-226 and U-235, NAREL's gamma analysis software tends to overestimate the amounts of these nuclides whenever both are present in a sample. Lower estimates for Ra-226 activities can be obtained from the reported activities of its decay products, Pb-214 and Bi-214, which are likely to be somewhat less than the Ra-226 activity because of the potential escape of radon gas.

NAREL's gamma spectroscopy software corrects activities and MDCs for decay between collection and analysis, but only up to a limit of ten half-lives. So, if the decay time for a sample is more than ten half-lives of a radionuclide, that nuclide will almost always be undetected and the reported MDC will be meaningless. This is usually a problem only for short-lived radionuclides, such as I-131 and Ba-140, when there is a long delay between collection and analysis.

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GAMMA ANALYSES
SDG #0200037

ANALYSIS SUMMARY

Analysis Procedure: NAREL GAM-01
Title: Gamma Spectrometry

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Prep Batch #	QC Batch #
A2.03832M		N/A	08/28/2002	0007051T	0002581J
A2.03833N		N/A	08/29/2002	0007054W	0002581J
A2.03834P		N/A	08/29/2002	0007054W	0002581J
A2.03835Q		N/A	08/29/2002	0007054W	0002581J
A2.03835Q	DUP	N/A	08/30/2002	0007054W	0002581J
A2.03836R		N/A	08/29/2002	0007054W	0002581J
A2.03837T		N/A	08/29/2002	0007054W	0002581J
A2.03838U		N/A	08/29/2002	0007054W	0002581J
A2.03839V		N/A	08/30/2002	0007067B	0002581J
A2.03844R		N/A	08/30/2002	0007067B	0002581J
A2.03845T		N/A	08/30/2002	0007067B	0002581J

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

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SAMPLE ANALYSIS REPORT

Sample #:	A2.03832M	QC batch #:	0002581J
Matrix:	SOIL	Prep batch #:	0007051T
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	3.310e+02 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	79.98 %	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

Comment: 8 FT. FROM BACK FENCE

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/27/2002 14:20	1000.0	GE07	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		9.2e-02	PCI/GDRY	08/15/2002
Bi214	*	2.24e-02	2.3e-02		PCI/GDRY	08/15/2002
Co60		ND		1.7e-02	PCI/GDRY	08/15/2002
Cs137		ND		1.6e-02	PCI/GDRY	08/15/2002
I131		ND		3.8e-02	PCI/GDRY	08/15/2002
K40		ND		1.4e-01	PCI/GDRY	08/15/2002
Pb212		2.19e-02	2.1e-02		PCI/GDRY	08/15/2002
Pb214	*	2.32e-02	2.2e-02		PCI/GDRY	08/15/2002
Ra226		ND		2.7e-01	PCI/GDRY	08/15/2002
Ra228		ND		5.0e-02	PCI/GDRY	08/15/2002

* An asterisk indicates a result whose value may be significantly over or underestimated.

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SAMPLE ANALYSIS REPORT

Sample #:	A2.03833N	QC batch #:	0002581J
Matrix:	SOIL	Prep batch #:	0007054W
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	4.110e+02 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	91.22 %	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

Comment: 1 METER WEST OF NP #12

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/28/2002 14:04	1000.0	GE02	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		7.3e-01	PCI/GDRY	08/15/2002
Bi214	*	5.75e-01	1.0e-01		PCI/GDRY	08/15/2002
Co60		4.10e+01	2.3e+00		PCI/GDRY	08/15/2002
Cs137		1.94e-01	5.9e-02		PCI/GDRY	08/15/2002
I131		ND		2.4e-01	PCI/GDRY	08/15/2002
K40		8.85e+00	6.7e-01		PCI/GDRY	08/15/2002
Pb212		7.01e-01	7.1e-02		PCI/GDRY	08/15/2002
Pb214	*	6.44e-01	8.3e-02		PCI/GDRY	08/15/2002
Ra226	*	1.48e+00	6.3e-01		PCI/GDRY	08/15/2002
Ra228		5.11e-01	1.6e-01		PCI/GDRY	08/15/2002
Tl208		2.60e-01	6.5e-02		PCI/GDRY	08/15/2002

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SAMPLE ANALYSIS REPORT

Sample #:	A2.03834P	QC batch #:	0002581J
Matrix:	SOIL	Prep batch #:	0007054W
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	3.650e+02 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	82.57 %	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

Comment: SOUTH POWER POLE - WEST PROPERTY LINE

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/28/2002 14:04	1000.0	GE03	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		5.7e-01	PCI/GDRY	08/15/2002
Be7		6.21e-01	3.1e-01		PCI/GDRY	08/15/2002
Bi212		1.40e+00	5.5e-01		PCI/GDRY	08/15/2002
Bi214	*	9.49e-01	8.4e-02		PCI/GDRY	08/15/2002
Co60		5.39e+01	3.1e+00		PCI/GDRY	08/15/2002
Cs137		3.05e-01	4.3e-02		PCI/GDRY	08/15/2002
I131		ND		2.2e-01	PCI/GDRY	08/15/2002
K40		2.60e+01	1.5e+00		PCI/GDRY	08/15/2002
Pb212		1.62e+00	1.1e-01		PCI/GDRY	08/15/2002
Pb214	*	1.14e+00	9.0e-02		PCI/GDRY	08/15/2002
Ra224		9.79e-01	7.0e-01		PCI/GDRY	08/15/2002
Ra226	*	2.55e+00	6.2e-01		PCI/GDRY	08/15/2002
Ra228		1.19e+00	1.5e-01		PCI/GDRY	08/15/2002
Tl208		5.08e-01	4.7e-02		PCI/GDRY	08/15/2002

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SAMPLE ANALYSIS REPORT

Sample #:	A2.03835Q	QC batch #:	0002581J
Matrix:	SOIL	Prep batch #:	0007054W
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	3.750e+02 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	83.54 %	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

Comment: FENCE LINE - SW CORNER

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/28/2002 14:04	1000.0	GE04	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		5.1e-01	PCI/GDRY	08/15/2002
Be7		5.89e-01	3.0e-01		PCI/GDRY	08/15/2002
Bi212		1.52e+00	6.0e-01		PCI/GDRY	08/15/2002
Bi214	*	9.08e-01	8.2e-02		PCI/GDRY	08/15/2002
Co60		3.37e+01	1.9e+00		PCI/GDRY	08/15/2002
Cs137		2.43e-01	4.3e-02		PCI/GDRY	08/15/2002
I131		ND		1.9e-01	PCI/GDRY	08/15/2002
K40		1.91e+01	1.1e+00		PCI/GDRY	08/15/2002
Pb212		1.42e+00	9.8e-02		PCI/GDRY	08/15/2002
Pb214	*	1.04e+00	8.1e-02		PCI/GDRY	08/15/2002
Ra224		1.20e+00	6.6e-01		PCI/GDRY	08/15/2002
Ra226	*	2.73e+00	5.7e-01		PCI/GDRY	08/15/2002
Ra228		1.14e+00	1.3e-01		PCI/GDRY	08/15/2002
Tl208		4.66e-01	4.5e-02		PCI/GDRY	08/15/2002

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SAMPLE ANALYSIS REPORT

Sample #:	A2.03835Q	QC batch #:	0002581J
Matrix:	SOIL	Prep batch #:	0007054W
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	3.750e+02 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	83.54 %	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	DUP

Comment: FENCE LINE - SW CORNER

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/29/2002 13:30	1000.0	GE02	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		7.5e-01	PCI/GDRY	08/15/2002
Be7		3.50e-01	3.7e-01		PCI/GDRY	08/15/2002
Bi212		1.48e+00	1.1e+00		PCI/GDRY	08/15/2002
Bi214	*	9.86e-01	1.1e-01		PCI/GDRY	08/15/2002
Co60		3.49e+01	2.0e+00		PCI/GDRY	08/15/2002
Cs137		2.52e-01	6.3e-02		PCI/GDRY	08/15/2002
I131		ND		2.6e-01	PCI/GDRY	08/15/2002
K40		1.90e+01	1.3e+00		PCI/GDRY	08/15/2002
Pb212		1.40e+00	1.1e-01		PCI/GDRY	08/15/2002
Pb214	*	9.87e-01	9.4e-02		PCI/GDRY	08/15/2002
Ra224		1.62e+00	9.0e-01		PCI/GDRY	08/15/2002
Ra226	*	2.30e+00	7.0e-01		PCI/GDRY	08/15/2002
Ra228		1.12e+00	1.8e-01		PCI/GDRY	08/15/2002
Tl208		4.44e-01	6.1e-02		PCI/GDRY	08/15/2002

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SAMPLE ANALYSIS REPORT

Sample #:	A2.03836R	QC batch #:	0002581J
Matrix:	SOIL	Prep batch #:	0007054W
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	3.630e+02 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	86.50 %	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

Comment: 5 FT. W OF FENCE

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/28/2002 14:05	1000.0	GE05	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		3.2e-01	PCI/GDRY	08/15/2002
Bi212		1.12e+00	3.5e-01		PCI/GDRY	08/15/2002
Bi214	*	7.85e-01	6.5e-02		PCI/GDRY	08/15/2002
Co60		1.17e+01	6.7e-01		PCI/GDRY	08/15/2002
Cs137		1.99e-01	3.1e-02		PCI/GDRY	08/15/2002
I131		ND		1.1e-01	PCI/GDRY	08/15/2002
K40		1.41e+01	8.8e-01		PCI/GDRY	08/15/2002
Pb212		1.16e+00	7.8e-02		PCI/GDRY	08/15/2002
Pb214	*	8.20e-01	6.1e-02		PCI/GDRY	08/15/2002
Ra224		7.76e-01	4.5e-01		PCI/GDRY	08/15/2002
Ra226	*	2.01e+00	4.1e-01		PCI/GDRY	08/15/2002
Ra228		1.01e+00	9.8e-02		PCI/GDRY	08/15/2002
Th234	*	1.06e+00	3.0e-01		PCI/GDRY	08/15/2002
Tl208		3.53e-01	3.6e-02		PCI/GDRY	08/15/2002

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SAMPLE ANALYSIS REPORT

Sample #:	A2.03837T	QC batch #:	0002581J
Matrix:	SOIL	Prep batch #:	0007054W
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	3.720e+02 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	88.18 %	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

Comment: RR SIDING - 2 1/2 POSTS E OF SW CORNER

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/28/2002 14:05	1000.0	GE06	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		9.1e-01	PCI/GDRY	08/15/2002
Bi214	*	5.52e-01	9.8e-02		PCI/GDRY	08/15/2002
Co60		1.16e+02	6.6e+00		PCI/GDRY	08/15/2002
Cs137		6.10e-01	7.6e-02		PCI/GDRY	08/15/2002
I131		ND		3.3e-01	PCI/GDRY	08/15/2002
K40		9.76e+00	6.6e-01		PCI/GDRY	08/15/2002
Pb212		7.02e-01	1.0e-01		PCI/GDRY	08/15/2002
Pb214	*	5.66e-01	9.7e-02		PCI/GDRY	08/15/2002
Ra226	*	2.08e+00	1.0e+00		PCI/GDRY	08/15/2002
Ra228		ND		7.7e-01	PCI/GDRY	08/15/2002
Tl208		2.78e-01	6.7e-02		PCI/GDRY	08/15/2002

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SAMPLE ANALYSIS REPORT

Sample #:	A2.03838U	QC batch #:	0002581J
Matrix:	SOIL	Prep batch #:	0007054W
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	3.700e+02 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	96.16 %	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

Comment: 5 FT. E OF STOP SIGN

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/28/2002 14:05	1000.0	GE07	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		3.8e-01	PCI/GDRY	08/15/2002
Be7		2.10e-01	1.7e-01		PCI/GDRY	08/15/2002
Bi212		4.85e-01	3.7e-01		PCI/GDRY	08/15/2002
Bi214	*	5.59e-01	6.2e-02		PCI/GDRY	08/15/2002
Co60		1.69e+01	9.6e-01		PCI/GDRY	08/15/2002
Cs137		4.03e-01	3.9e-02		PCI/GDRY	08/15/2002
I131		ND		1.3e-01	PCI/GDRY	08/15/2002
K40		1.11e+01	7.1e-01		PCI/GDRY	08/15/2002
Pb212		8.00e-01	6.3e-02		PCI/GDRY	08/15/2002
Pb214	*	6.48e-01	6.1e-02		PCI/GDRY	08/15/2002
Ra224		1.00e+00	6.3e-01		PCI/GDRY	08/15/2002
Ra226	*	1.10e+00	4.0e-01		PCI/GDRY	08/15/2002
Ra228		6.95e-01	9.5e-02		PCI/GDRY	08/15/2002
Tl208		2.53e-01	3.2e-02		PCI/GDRY	08/15/2002

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SAMPLE ANALYSIS REPORT

Sample #:	A2.03839V	QC batch #:	0002581J
Matrix:	SOIL	Prep batch #:	0007067B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	4.090e+02 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	93.43 %	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

Comment: WHITE HOUSE LAWN

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/29/2002 13:32	1000.0	GE06	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		5.5e-01	PCI/GDRY	08/15/2002
Bi212		1.09e+00	5.3e-01		PCI/GDRY	08/15/2002
Bi214	*	6.19e-01	6.4e-02		PCI/GDRY	08/15/2002
Co60		3.27e+01	1.9e+00		PCI/GDRY	08/15/2002
Cs137		4.49e-01	5.0e-02		PCI/GDRY	08/15/2002
I131		ND		1.9e-01	PCI/GDRY	08/15/2002
K40		1.66e+01	1.0e+00		PCI/GDRY	08/15/2002
Pb212		1.08e+00	8.2e-02		PCI/GDRY	08/15/2002
Pb214	*	7.07e-01	6.7e-02		PCI/GDRY	08/15/2002
Ra224		8.33e-01	7.1e-01		PCI/GDRY	08/15/2002
Ra226	*	1.74e+00	4.6e-01		PCI/GDRY	08/15/2002
Ra228		8.86e-01	1.2e-01		PCI/GDRY	08/15/2002
Tl208		3.35e-01	3.9e-02		PCI/GDRY	08/15/2002

* An asterisk indicates a result whose value may be significantly over or underestimated.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0200037

SAMPLE ANALYSIS REPORT

Sample #:	A2.03844R	QC batch #:	0002581J
Matrix:	SOIL	Prep batch #:	0007067B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	3.810e+02 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	92.49 %	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

Comment: DICKERSON CONSERVATION PARK

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/29/2002 13:31	1000.0	GE10	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		1.7e-01	PCI/GDRY	08/14/2002
Be7		2.32e-01	1.1e-01		PCI/GDRY	08/14/2002
Bi212		1.12e+00	1.8e-01		PCI/GDRY	08/14/2002
Bi214	*	9.26e-01	6.2e-02		PCI/GDRY	08/14/2002
Co60		ND		3.0e-02	PCI/GDRY	08/14/2002
Cs137		2.99e-01	2.5e-02		PCI/GDRY	08/14/2002
I131		ND		7.5e-02	PCI/GDRY	08/14/2002
K40		1.54e+01	9.4e-01		PCI/GDRY	08/14/2002
Pa234m	*	1.55e+00	1.6e+00		PCI/GDRY	08/14/2002
Pb212		1.22e+00	7.7e-02		PCI/GDRY	08/14/2002
Pb214	*	9.73e-01	6.3e-02		PCI/GDRY	08/14/2002
Ra224		9.35e-01	3.3e-01		PCI/GDRY	08/14/2002
Ra226	*	2.42e+00	3.2e-01		PCI/GDRY	08/14/2002
Ra228		1.07e+00	7.6e-02		PCI/GDRY	08/14/2002
Th234	*	1.04e+00	2.1e-01		PCI/GDRY	08/14/2002
Tl208		3.74e-01	2.8e-02		PCI/GDRY	08/14/2002

* An asterisk indicates a result whose value may be significantly over or underestimated.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0200037

SAMPLE ANALYSIS REPORT

Sample #:	A2.03845T	QC batch #:	0002581J
Matrix:	SOIL	Prep batch #:	0007067B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	3.060e+02 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	91.30 %	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

Comment: FIRE STATION - BEALSVILLE

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/29/2002 13:31	1000.0	GE11	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		1.6e-01	PCI/GDRY	08/15/2002
Be7		6.59e-01	1.0e-01		PCI/GDRY	08/15/2002
Bi212		1.51e+00	1.9e-01		PCI/GDRY	08/15/2002
Bi214	*	9.15e-01	6.1e-02		PCI/GDRY	08/15/2002
Co60		ND		2.6e-02	PCI/GDRY	08/15/2002
Cs137		4.35e-01	3.1e-02		PCI/GDRY	08/15/2002
I131		ND		7.0e-02	PCI/GDRY	08/15/2002
K40		1.70e+01	1.0e+00		PCI/GDRY	08/15/2002
Pa234m	*	1.28e+00	1.4e+00		PCI/GDRY	08/15/2002
Pb212		1.78e+00	1.1e-01		PCI/GDRY	08/15/2002
Pb214	*	9.82e-01	6.3e-02		PCI/GDRY	08/15/2002
Ra224		1.52e+00	3.1e-01		PCI/GDRY	08/15/2002
Ra226	*	2.21e+00	3.3e-01		PCI/GDRY	08/15/2002
Ra228		1.58e+00	1.0e-01		PCI/GDRY	08/15/2002
Th234	*	6.99e-01	2.2e-01		PCI/GDRY	08/15/2002
Tl208		5.54e-01	3.7e-02		PCI/GDRY	08/15/2002
U235	*	1.40e-01	2.0e-02		PCI/GDRY	08/15/2002

* An asterisk indicates a result whose value may be significantly over or underestimated.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #0200037

QC BATCH SUMMARY

QC batch #: 0002581J
Preparation procedure: N/A
Analysis procedure: NAREL GAM-01

NAREL Sample #	QC Type	Yield (%)	± 2σ Uncertainty (%)	Analyst
A2.03832M		N/A		N/A
A2.03833N		N/A		N/A
A2.03834P		N/A		N/A
A2.03835Q		N/A		N/A
A2.03835Q	DUP	N/A		N/A
A2.03836R		N/A		N/A
A2.03837T		N/A		N/A
A2.03838U		N/A		N/A
A2.03839V		N/A		N/A
A2.03844R		N/A		N/A
A2.03845T		N/A		N/A

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

National Air and Radiation Environmental Laboratory
QC Batch Report

QC Batch #: 0002581J Analytical Procedure: NAREL GAM-01

LABORATORY DUPLICATES (PCI/GDRY)

Sample ID	Nuclide	Original ± 2σ	Duplicate ± 2σ	RPD	Z
A2.03835Q	BA140				
A2.03835Q	BE7	5.89e-01 ± 3.0e-01	3.50e-01 ± 3.7e-01	50.91	-0.99 OK
A2.03835Q	BI212	1.52e+00 ± 6.0e-01	1.48e+00 ± 1.1e+00	2.67	-0.07 OK
A2.03835Q	BI214	9.08e-01 ± 8.2e-02	9.86e-01 ± 1.1e-01	8.24	0.82 OK
A2.03835Q	CO60	3.37e+01 ± 1.9e+00	3.49e+01 ± 2.0e+00	3.50	0.43 OK
A2.03835Q	CS137	2.43e-01 ± 4.3e-02	2.52e-01 ± 6.3e-02	3.64	0.21 OK
A2.03835Q	I131				
A2.03835Q	K40	1.91e+01 ± 1.1e+00	1.90e+01 ± 1.3e+00	0.52	-0.06 OK
A2.03835Q	PB212	1.42e+00 ± 9.8e-02	1.40e+00 ± 1.1e-01	1.42	-0.16 OK
A2.03835Q	PB214	1.04e+00 ± 8.1e-02	9.87e-01 ± 9.4e-02	5.23	-0.56 OK
A2.03835Q	RA224	1.20e+00 ± 6.6e-01	1.62e+00 ± 9.0e-01	29.79	0.74 OK
A2.03835Q	RA226	2.73e+00 ± 5.7e-01	2.30e+00 ± 7.0e-01	17.10	-0.89 OK
A2.03835Q	RA228	1.14e+00 ± 1.3e-01	1.12e+00 ± 1.8e-01	1.77	-0.15 OK
A2.03835Q	TL208	4.66e-01 ± 4.5e-02	4.44e-01 ± 6.1e-02	4.84	-0.44 OK

Analyst: N/A

QA Officer: Linda D McElroy 9/11/02

NEUTRON PRODUCTS INC
22301 Mt. Ephraim Road, P. O. Box 68
Dickerson, Maryland 20842 USA
301-349-5001 FAX: 301-349-2433
e-mail: neutronprod@erols.com

29 August 2002

Via FAX (410) 631-3198

Mr. Roland G. Fletcher
Program Manager III
Radiological Health Program
Maryland Department of the Environment
2500 Broening Highway
Baltimore, MD 21224

Dear Mr. Fletcher,

This letter is in timely response to yours dated August 8, 2002 and received here on August 9. Before addressing the specific alleged violations, I have noticed that the first four alleged violations contain the common wording that I "failed to respond in writing as required by the March 21, 2002 Departmental Letter-Notice of Violation."

I call your attention to the first page of our response to that NOV, wherein I remark that the first four alleged violations from the March 21 NOV were virtually identical to those from the previous several NOV's and that, because our response was also virtually identical, I decided not to include it. However, I offered to provide it if you so requested. We never received such a request, and so I never sent the 16 pages of the response devoted to alleged violations 1-4.

However, from this current NOV, I understand that you would like the responses to violations 1-4 and I have included them accordingly.

Alleged Violation #1 states:

"1. Section C.31 titled, 'Specific Terms and Conditions of License' and License Condition 22.B(2) which requires, in part, that all soils, wherever found contaminated by NPI licensed activities and exhibiting levels of cobalt-60 contamination exceeding 8 picocuries per gram above background must be removed by NPI and properly stored/disposed of as radioactive waste.

"Contrary to Section C.31 and License Condition 22.B(2), NPI failed to remove cobalt-60 contaminated soil exceeding the above-specified limit. Specifically, on September 20, 2000 RHP inspectors collected soil samples at sites located both on and off of the NPI facility. Maryland Radiation Laboratory sampling results from these samples indicated that of the 10 samples taken, all indicated soil having cobalt-60 concentrations exceeding 8 picocuries per gram. The range

was from 28 - 610 picocuries per gram of soil. NPI failed to remove the contaminated soils from the areas exceeding the license limit. NPI has been in continuous violation of this requirement since May 23, 1989. Furthermore, NPI has still not removed the soil contaminated with cobalt-60 from the adjacent railroad property to establish compliance with the 8.0 picocurie per gram concentration limit. Monthly soil samples collected from the dry pond area and analyzed by NPI personnel in October, November and December 2001 also exceeded the regulatory limit. The Stipulation and Settlement (Civil Case No. 76639 in the Circuit Court of Montgomery County) dated January 3, 1994 required NPI to clean these contaminated areas by June 15,1994. NPI has missed this deadline and has refused to remediate this property. Each month in 2002, NPI continued to identify contaminated soil that exceeds these regulatory limits, however, Messrs Jackson and Bill Ransohoff refuse to correct this violation by removing the contaminated soils that exceed the regulatory limit for disposal. This is a violation of item 2 of the November 3, 2000 Montgomery County Circuit Court Order. This violation was also identified during the December 2001 inspection, however Mr. Jackson Ransohoff failed to respond in writing as required by the March 21, 2002 Departmental Letter-Notice of Violation."

Response

1.1 As a preliminary matter, from the wording of the alleged violation ("of the 10 samples taken, all indicated [contamination]") a person unfamiliar with our facility could get the impression that the entire property is contaminated and that, wherever one puts a shovel in the ground, one will find contamination. Clearly, that is not the case. In fact, monthly samples taken from randomly selected areas around the plant rarely show unexpected areas of contamination. It is well known to the Department which areas are contaminated and it is only those areas which were sampled during the referenced inspection, so it is not surprising that all of the samples exhibited some degree of contamination.

1.2 Secondly, your statement that Neutron "missed ...[the June 15, 1994]...deadline and has refused to remediate this property" is materially misleading. Specifically, it is well known to the Department:

> that Neutron performed its periodic removal of contaminated soil from the dry pond and the areas downstream thereof, and cleaned both the downstream rip-rap and the upstream stone trap at the earliest practical opportunity that spring, which had been unusually wet;
>
> that the effort resulted in a substantive, and far more than ALARA optimum, reduction of radioactivity throughout the area of interest; and
>
> that no additional work was either required by the settlement or likely to benefit persons, property or the environment in any credible way.

1.3 This license condition is much more stringent than applicable state and federal regulations, without any demonstrable public health and safety or environmental benefit. While there does exist a very low level of radioactive contamination in the modest sized areas at issue, the most recent area survey shows that the highest dose rate in the area is approximately 0.05 mrem/hr., which is less than 3 % of the regulatory limit of 2 mrem/hr for dose rate in an unrestricted area. In addition, it is important to keep in mind that less than 70% of the waist-high dose rate in the most contaminated area is due to contamination, with the balance due to skyshine and natural background. A comparison of the regulatory limit with the dose rate in the affected area is graphically demonstrated in Figure 1.

1.4 In accordance with good health physics practices, Neutron has performed several evaluations to determine the likely dose received by any member of the public from the contamination referenced in Alleged Violation #1. Such evaluations have repeatedly shown that it is not credible that any member of the public could receive in excess of 2 mrem/year from the referenced contamination, a mere 2% of the limit set by duly promulgated regulations for annual exposure to members of the public, and less than 1% of average sea-level exposure from nature. RHP has never disputed these evaluations, nor are there any grounds for dispute of which Neutron is aware.

1.5 Moreover, your citation materially misrepresents the Stipulation and Settlement of 1994. As you well know, the referenced terms of settlement render the cited license condition unenforceable until 60 days after the courtyard has been enclosed, an event that has been indefinitely delayed by acts and omissions of MDE.

1.6 Finally, the written Stipulation and Settlement was supplemented by an oral agreement which provided that even after the source of continuing contamination has been removed, the level of decontamination then required shall be governed by ALARA because:

-- the levels of contamination do not present any credible health and safety concern, nor do they result in dose rates which even approach regulatory limits of 2 mrem/hr in any unrestricted area and 100 mrem/year of exposure received by any member of the public; and,

-- for whatever reason, the abandoned rail spur area has acted to remove contamination from the stormwater, thereby helping to prevent its spread downstream, and unnecessary disturbance of the rail siding could lead to contamination (however inconsequential) moving further downstream.

1.7 We are both well aware of the facts and allegations:

that, from the time of its inception in 1989, MDE has never justified the excessive

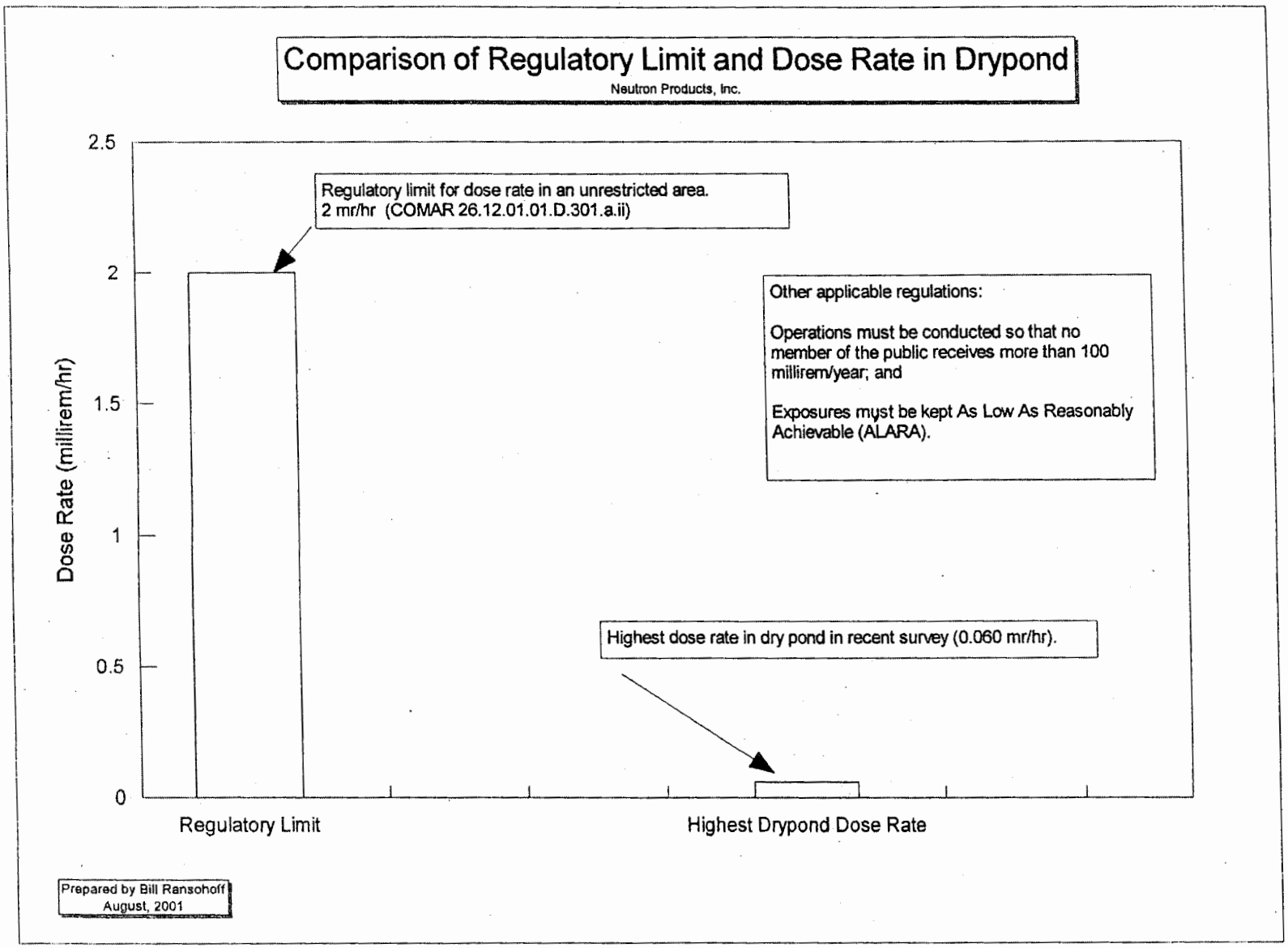
Comparison of Regulatory Limit and Dose Rate in Drypond
Neutron Products, Inc.
2.5
2
1.5
1
0.5
0
Dose Rate (millirem/hr)
Regulatory limit for dose rate in an unrestricted area.
2 mr/hr (COMAR 26.12.01.01.D.301.a.ii)
Other applicable regulations:
Operations must be conducted so that no member of the public receives more than 100 millirem/year; and
Exposures must be kept As Low As Reasonably Achievable (ALARA).
Highest dose rate in dry pond in recent survey (0.060 mr/hr).
Regulatory Limit
Highest Drypond Dose Rate
Prepared by Bill Ransohoff
August, 2001

FIGURE 1

stringency of what has become Extra-Regulatory License Condition ("ERLC") 22.B(2), nor has Neutron ever agreed that compliance with it is practical until the LAA Courtyard has been enclosed, perhaps not even then;

that in defense of its position, MDE sought the support of NRC Headquarters for the justification of its extraordinary stringency circa 1993, only to be turned down by letter dated January 4, 1994;

that instead of either adjusting its policies, ERLCs, and demands to reflect the NRC response, or otherwise working with Neutron to implement more practical License Conditions that require compliance with duly promulgated regulations, MDE has continued to cite and fine Neutron for its failure to comply in full with License Conditions far more stringent than ever justified by either NRC or MDE, while at the same time taking actions which impede Neutron's efforts and/or ability to comply with those very Conditions.

that MDE has pursued this course of action in defiance of both the spirit and the letter of Executive Order 01.01.1996.03 which requires it to rigorously justify any regulations (which MDE has always insisted include License Conditions) more stringent than their federal counterparts.

1.8 The time has long since passed for MDE to either rigorously justify the excessive stringency of ERLC 22.B(2), or work with Neutron as necessary to define a License Condition duly mindful of the public health and safety, with which it is practical for Neutron to comply.

1.9 As the following section shows, we have taken effective measures to greatly reduce the levels of soil contamination. However, as MDE is aware, although conditions have markedly improved since 1989, the basic fact that we will not be able to meet the 8 pCi/g requirement without enclosing the courtyard remains the same, so that when Item 2 was included in the November 3, 2000 Court Order, both MDE and Neutron were well aware that we would not be able to comply with some conditions in our license, thereby putting us in immediate violation of the Court Order.

Corrective Action

1.10 Because the construction of the Courtyard Enclosure has been stymied by the concerted efforts of MDE and a few vocal members of the community, Neutron has undertaken alternative means of reducing the very low levels of contamination leaving the site. As a result, the contamination along the abandoned rail siding has been substantially reduced even before the courtyard has been enclosed. The alternative measures have primarily focused on reducing the amount of incidental contamination reaching the courtyard, and improving the efficiency of the

stone trap and dry pond lying between the open courtyard and Neutron's southwest property line.

1.11 As RHP is well aware, since well before 1994 Neutron has, on numerous occasions, removed contaminated soil from the dry pond and areas downstream thereof. In addition, we have periodically cleaned portions of the stone trap in order to reduce the amount of contamination reaching the dry pond, a small fraction of which moves downstream therefrom.

1.12 Furthermore, we have invested in, and initiated the use of, a nuclear grade vacuum cleaner (with HEPA filter), the use of which is intended to reduce the amount of removable contamination within the LAA, thereby further reducing the amount of contamination reaching the courtyard and, ultimately, the drypond.

1.13 Our efforts also include periodic remediation of contaminated areas. Regarding your reference to the soil samples collected in September, 2000, our remediation efforts have been focused on the areas with the highest levels of contamination found during that inspection, namely the drypond, and you are well aware that our efforts in that regard are ongoing. In keeping with our past performance (and as forecast in our letter of April 12, 2002), we have conducted remediation on both the stone trap and the dry pond this summer, and we intend to continue periodic remediation efforts for the most contaminated areas.

1.14 Over the years, all of these efforts have proven effective in reducing the dose rates along the referenced rail siding, as is depicted graphically in Figure 2. Jeffrey Williams and Bill Ransohoff will be responsible for ensuring that these corrective action efforts continue.

Alleged Violation #2 states:

"2. Section D.101 titled, 'Radiation Protection Programs' states that in addition to complying with all other provisions of these regulations, a licensee shall use all means to maintain radiation exposures and releases of radioactive material as low as reasonably achievable (ALARA).

a "Contrary to Section D.101, the licensee failed to use all means necessary to maintain release of radioactive material as low as reasonably achievable. Specifically, NPI has failed to use means necessary such as the adequate containment of radioactive materials, proper waste storage practices and regular shipments of radioactive waste, to a licensed repository. One only has to review the soil sample results referred to in violation #1 to determine that NPI is not maintaining control over their radioactive material and it is continuing to be released. In spite of curtailed source-manufacturing activities, NPI continues to release cobalt-60 into the environment in an uncontrolled manner. Contaminated areas of the LAA lack adequate containment and release pathways are not continuously monitored. This is a violation of item 2 of the November 3, 2000

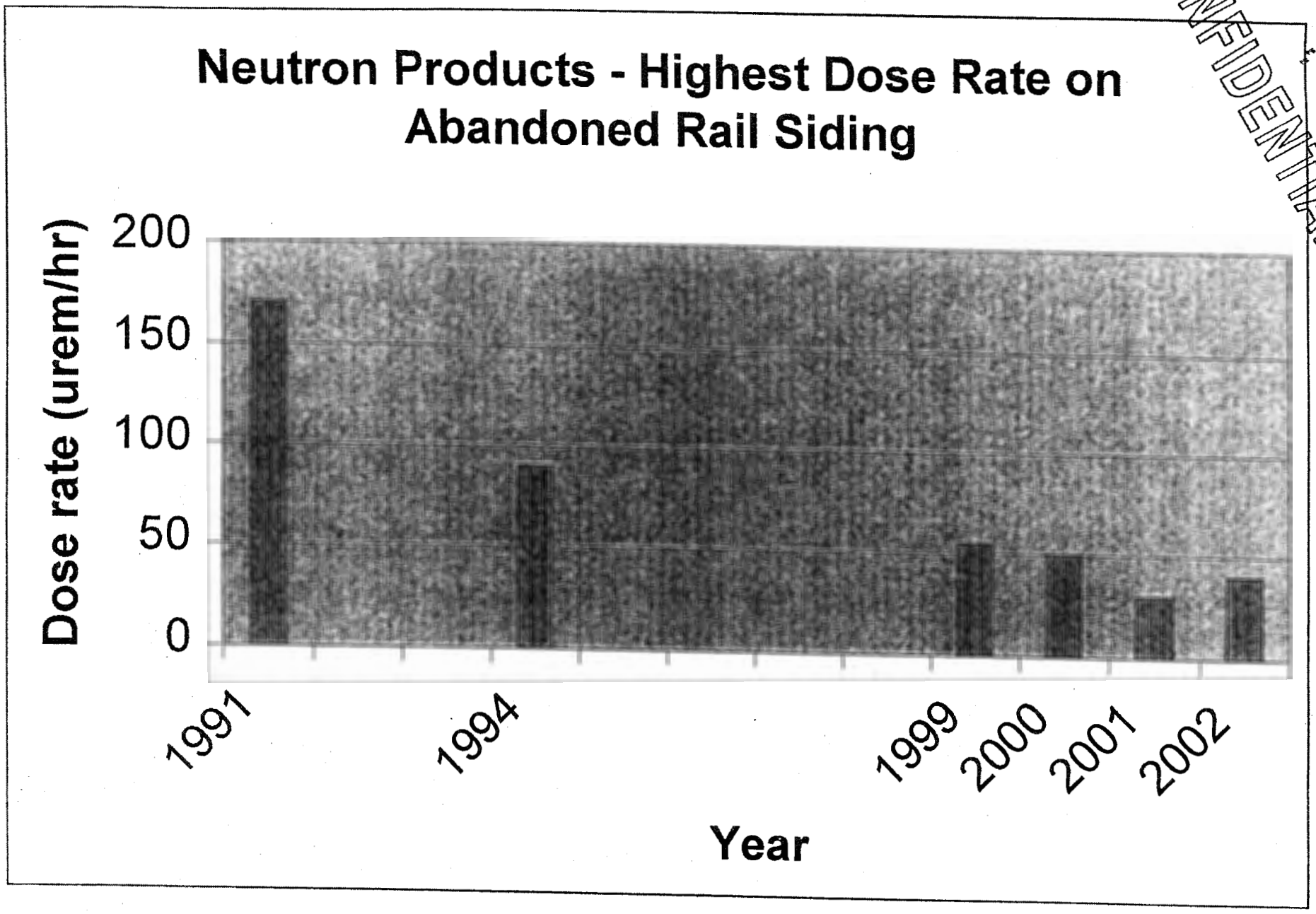

FIGURE 2

Montgomery County Circuit Court Order. Messrs. Jackson and Billy Ransohoff refuse to comply with this regulation and this Court Order. Furthermore, Messrs. Jackson and Billy Ransohoff refuse to adequately clean contaminated areas, remove contaminated soils, ship radioactive waste as required and install containment necessary to prevent uncontrolled releases of radioactive material. This violation was also identified during the December 2001 Inspection, however Mr. Jackson Ransohoff failed ro respond in writing as required by the March 21, 2002 Departmental Letter-Notice of Violation.

b On June 27, 2002, NPI released a plastic bag containing paper towels and rags contaminated with approximately 12 microcuries of cobalt-60 into the general public. Specifically, NPI employees sent a roll off refuse container containing the licensed radioactive material to the Shady Grove Waste Transfer Station for disposal."

Response

2.1 The dispute between Neutron and MDE regarding ALARA is well documented. Neutron submits that it arises primarily out of MDE's working interpretation of ALARA to mean "as low as possible", thereby effectively reducing to zero all numerical regulatory limits and removing the need for any quantitative analysis which is required to determine what is "reasonable" as defined in NUREG 1530. This citation, as well as citation #1 are illustrative of the severe damages arising from MDE's insistent misinterpretation of ALARA.

2.2 Both Neutron and MDE agree that, in addition to complying with numerical limits in the regulations, licensees must also keep personnel exposures and releases of radioactive material ALARA. In this case, Neutron is in compliance with the numerical limits, such as radiation dose rates in unrestricted areas, doses received by members of the public, etc., so that ALARA considerations should dictate the extent of additional radiation protection measures taken by Neutron.

2.3 However, in order to perform an ALARA analysis to determine whether or not a licensee must further reduce releases or exposures, some dollar figure must be assessed to a person-rem of exposure saved, so that the cost of a particular proposed action can be compared with the benefit to be realized by the performance of that action. NUREG 1530 states that 1 person-rem of exposure saved is equivalent in value to a monetary cost of $2,000. In other words, if the licensee can reduce personnel exposures by 1 person-rem by taking action which costs $2,000 or less, then the ALARA clause of the regulations requires that licensee to take that action. If the action would cost more than $2,000 per person-Rem saved, the licensee is not so obligated.

2.4 In this case, MDE is claiming that the soil sample results discussed in alleged violation #1

constitute *prima facie* evidence of an ALARA violation. However, Neutron has repeatedly shown that the person receiving the highest dose from the contaminated soil receives less than 3 millirem per year therefrom. For the purposes of this analysis, assume that the cumulative exposure attributable to the soil for all members of the public is 10 mrem/year, a number which is higher than credible. If Neutron could entirely eliminate its releases and remove all of the contaminated soil, as MDE requires, then it would reduce exposures by 10 mrem/year. Using the $2,000 per person-rem figure provided in NUREG 1530, ALARA dictates that if Neutron could do this for less than $20 per year, it is obliged to do so.

2.5 In fact, even though there is no off-setting public health and safety benefit to be derived therefrom, by the measures noted in 1.10 through 1.13 above, Neutron has devoted many times the $20/year of human and material resources required by ALARA in a dedicated effort to ameliorate its inability to comply with the extra-regulatory license condition at issue here (22.B).

2.6 MDE also claims that Neutron's shipment of radioactive waste is not ALARA. Again, MDE's claims are not supported by facts or analysis. Neutron's previous analysis was based on experience gained during the two significant RadWaste shipments of 1990, during which Neutron employees received more than 60 person-rem of exposure. The schedule proposed by MDE in License Condition 21 would require several similar shipments, thereby causing Neutron's employees to incur significant additional occupational exposure. Neutron estimates that, as a result of these shipments, approximately 0.5 person-rem/year of public exposure would be saved. Thus, MDE's requirement would be clearly counter-ALARA based on radiation exposures alone, and when monetary costs are factored into the equation, it would be even more so.

2.7 MDE's claim that we have not installed "containment necessary to prevent uncontrolled releases of radioactive material" ignores our efforts to design, license and build the courtyard enclosure which were thwarted by MDE's failure to support the project at the hearing before the Maryland National Capitol Park and Planning Commission. As explained elsewhere, Neutron has had to resort to other measures to control the release of contamination from the LAA, and those other measures are clearly ALARA.

2.8 Again, the measures which Neutron has taken over the past few years have been effective at steadily reducing both the material exposures of employees and the inconsequential exposures of members of the public. The data for the past several years of the Dickerson resident receiving the highest exposure from Neutron's operations are presented graphically in Figure 3. The significant decrease in the year 2000 is partially attributable to the North Waste Room reorganization conducted in December, 1999 at a cost in terms of employee exposures and dollars expended which was much higher than justified by ALARA.

2.9 We are concerned by MDE's statement in alleged violation #2 that:

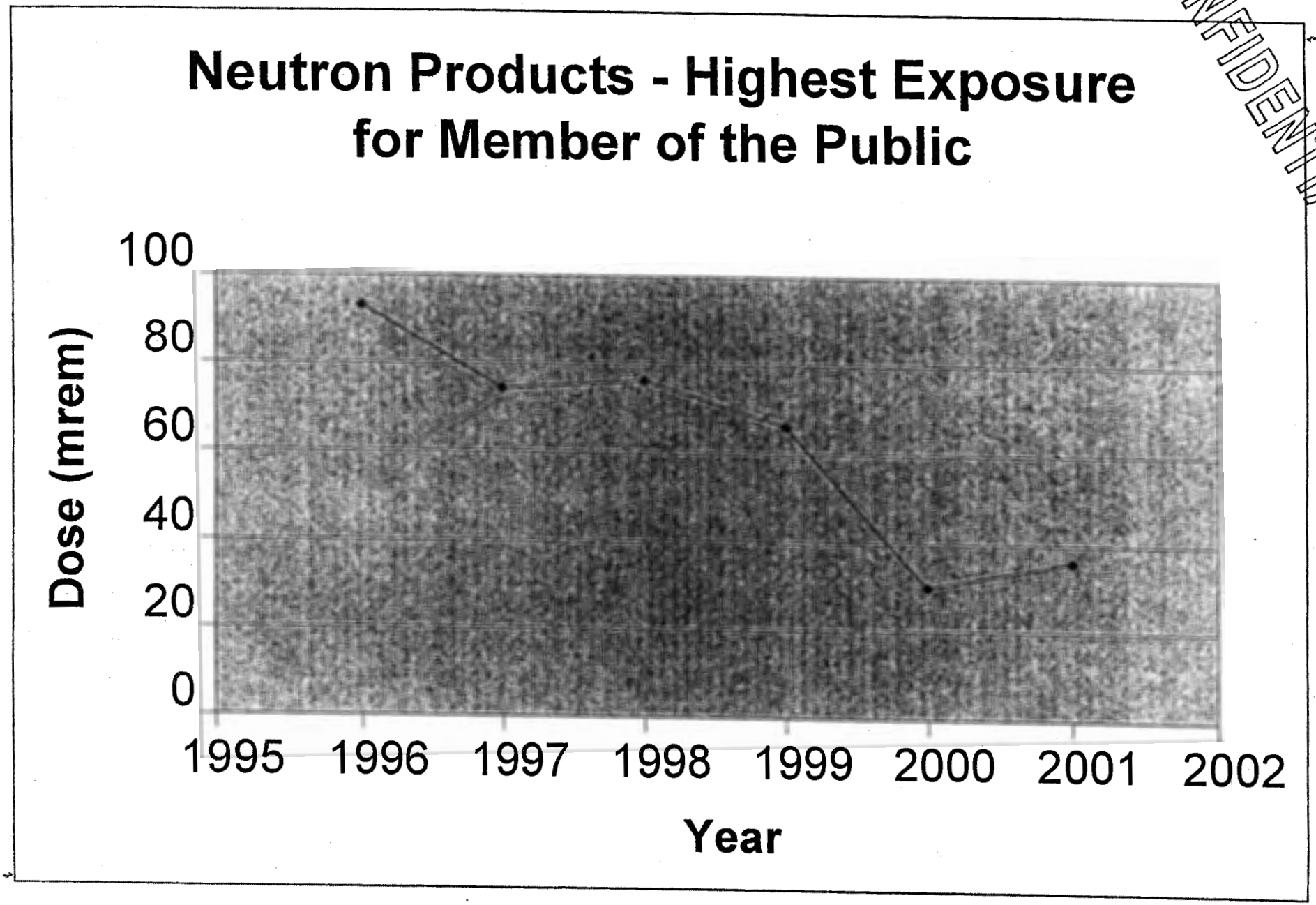

FIGURE 3

> "In spite of curtailed source-manufacturing activities, NPI continues to release cobalt-60 into the environment in an uncontrolled manner."

From this statement, it appears that MDE believes that the best way to eliminate the release of off-site contamination is to eliminate Neutron's source fabrication activities, a pretext which has no factual support and which leads MDE to acts and omissions which violate the Atomic Energy Act, Section 8-102 of the Environment Article, and Executive Order 01.01.1996.03. Neutron's alternative approach, which has been to attempt to reduce the amount of contamination in the LAA and to improve the efficiency of the portions of the facility designed to capture that contamination if it does leave the courtyard, allows Neutron to operate its business in moderate-to-wide margin conformance with the regulations (including ALARA) prudently directed to protecting the public health, employee safety and the quality of the environment without unduly discouraging the production and use of atomic energy in the public interest.

2.10 The contaminated bag of trash referred to in item (b) is thoroughly addressed herein in our Response to alleged violations 6 and 7.

Corrective Action

2.11 Although not obligated to do so by ALARA as described above, Neutron will continue its efforts to further reduce its inconsequential releases of radioactive material and exposures of members of the public. However, it cannot do so in good conscience at the expense of significant, unnecessary radiation exposures of its own employees, or unreasonable financial cost. The ALARA program will continue to be administered by the Radiation Safety Officer for the -01 license and reviewed by top management.

Alleged Violation #3 states:

"3. Section C.31 titled, 'Specific Terms and Conditions of License' and License Condition 21.B requires that within 90 days of the issuance of the license, NPI must submit to the Department for approval a comprehensive plan for disposal of all low level radioactive wastes in accordance with those specifications defined in this condition:

> "Contrary to Section C.31 and License Condition 21.B, NPI's low level radioactive waste plan was submitted to MDE on December 10, 1999; however, upon review it was found to be inadequate and as of this date a comprehensive plan acceptable to the Department has not been submitted. Deficiencies in the plan were discussed in a Departmental letter dated March 20, 2000, but NPI has not adequately responded to it. On October 20, 2000 the RHP received NPI's Decommissioning Plan dated October 27, 2000 which included a planned schedule for radioactive waste shipments. The RHP has reviewed this plan and determined that it is inadequate because it does not demonstrate compliance with the

current radioactive material license waste disposal criteria. Table 2.1 of this plan describes a 12-year shipment schedule for only a small fraction of the total activity of current radioactive waste inventory. The plan did not describe the shipment schedule and protocol for the disposal of the contaminated soil in storage. All radioactive waste that was generated prior to August 1999 is required to be shipped for disposal by August 2004. NPI has been in continuous violation of this requirement since the November 1999 inspection. This violation was once again identified during the December 2001 Inspection, however, Mr. Jackson Ransohoff failed ro respond in writing as required by the March 21, 2002 Departmental Letter-Notice of Violation. This is a violation of the November 3, 2000 Montgomery County Circuit Court Order. Messrs. Jackson and Billy Ransohoff have refused to comply with this license condition and the Court Order."

Because Concerns #5 and #6 are very similar to this Alleged Violation, they are addressed here as well.

Concern #5 states:

"Dickerson residents living near the plant are exposed to unnecessary levels of radiation caused by radioactive waste stored on site. NPI has missed several waste shipment deadlines. In fact, NPI has not shipped radioactive waste for disposal in over a year."

Concern #6 states:

"NPI has still not submitted an adequate decommissioning plan or waste disposal plan."

Response

3.1 As you know, Neutron is contesting this license with particular emphasis upon Condition 21 because, as written, it would cause Neutron to incur inordinate financial costs and expose its employees to unnecessarily high levels of radiation exposure, thereby forcing Neutron into clear violations of ALARA as defined in both NRC and Maryland regulations. At the present time, Neutron recognizes that this contested license is in effect, it is attempting to abide by those conditions which it is practical to satisfy, and we will require State cooperation for those which cannot be satisfied.

3.2 The only facilities currently available for much of our RadWaste are the Chem-Nuclear facility in Barnwell, South Carolina, (the continued availability of which to Maryland licensees is far from certain), and the recently opened containerized Class A cell at Envirocare. As you know, Maryland (as well as most of the other states in the country) has failed to comply with the Low Level Waste Policy Amendments Act of 1985 (the "LLWPAA") which obligated each state to provide disposal facilities for low level RadWaste generated within its borders or region. This

failure on the part of the states has produced a tenuous situation which places our future ability to send RadWaste to Barnwell in doubt and which has emboldened the State of South Carolina, and now, apparently, the State of Utah, to impose a tax on out-of-state RadWaste that is clearly designed to punish the licensees of other states for the failure of their State Governments to comply with the LLWPAA, and considerably increase the cost of disposal for licensees such as Neutron.

3.3 Despite all of the uncertainties, both the waste disposal plan and the decommissioning plan we submitted are practical, and explain how we would dispose of waste generated by continuing operations as well as waste currently on-site. We would welcome an opportunity to meet together with MDE, the NRC, and other appropriate parties to arrive at a mutually agreeable remedy.

3.4 It is true that although Table 2.1 of the decommissioning plan addresses the largest volume component of Neutron's RadWaste inventory, it only addresses a small fraction of the activity component of that inventory. This is primarily due to the high curie surcharge associated with disposal at Barnwell, which is structured in such a way as to encourage licensees such as Neutron to maximize the extent of disposal by decay and minimize the number of shipments. For example, as graphically illustrated in Figure 4, the cost of one shipment containing 4,500 Ci has a small fraction of the surcharge associated with 90 shipments containing 50 Ci each, as suggested at one time by MDE. Thus, Neutron has planned the "Big Shipment" at the end of its decommissioning plan, rather than a series of moderate activity shipments in the interim. Such an approach is clearly ALARA because:

> most of the activity at issue is encapsulated and stored in pools and canals where it is well-shielded and contributes nothing to the radiation dose rate or the level of risk within the facility or in the community;
>
> any time we ship significant amounts of high activity waste, we are likely to incur increased personnel exposures, so consolidating all the high activity waste in one such shipment helps to minimize personnel exposures; and,
>
> allowing the waste to decay for as long as practical before shipping it for disposal will reduce the occupational exposure of our employees in preparing the shipment, reduce the hazards of the transport itself, and will reduce the handling hazard and any associated occupational exposure at the disposal site.

3.5 In this NOV, MDE is insisting that all RadWaste generated before August, 1999 be shipped by August, 2004. By taking this inflexible position, MDE puts Neutron in an impossible situation because either it must defy MDE's wishes and not ship all of its waste by that deadline, or it must violate the ALARA provision of the regulations and cause its employees to incur

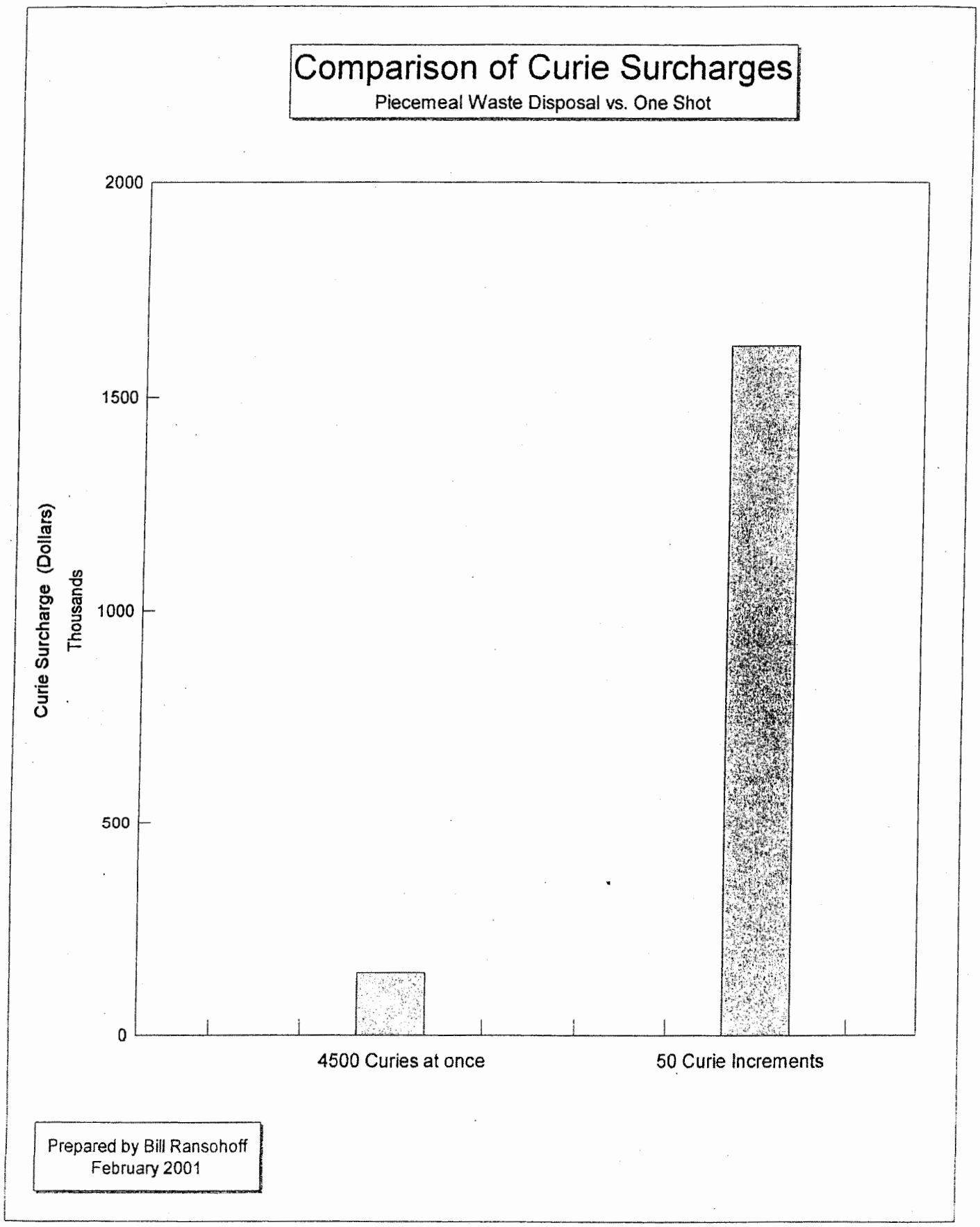
Comparison of Curie Surcharges
Piecemeal Waste Disposal vs. One Shot
2000
1500
1000
500
0
Curie Surcharge (Dollars)
Thousands
4500 Curies at once
50 Curie Increments
Prepared by Bill Ransohoff
February 2001

FIGURE 4

significant, unnecessary, easily avoidable radiation exposures and cause itself to incur unbearable financial costs. We submit that no regulator should place any of its licensees in such a position, but given those alternatives, we believe our primary obligation is to observe ALARA. Preferably, as you know, we will appeal this and other extra-regulatory license conditions to higher authorities as necessary and, in the interim, we are always available to negotiate genuinely practical alternative License Conditions.

3.6 Regarding the shipment of contaminated soil, as MDE is aware, the contained activity is so low that the packaged soil provides effective shielding, and we have been using it in that capacity for several years. Among other things, it has been an effective tool in our efforts to reduce exposures to members of the public and our own employees.

3.7 Furthermore, guidance provided by the NRC in its License Termination Rule indicates that ALARA should be used when determining the extent of remediation and waste disposal to be conducted, including the oft-repeated statement that:

> "[determination of the levels which are ALARA must take into account consideration of any detriments, such as traffic accidents, expected to potentially result from decontamination and waste disposal."

An ALARA analysis shows that shipping the contaminated soil would cost a substantial amount of money with no off-setting radiation health benefit because shipment of all contaminated soil would actually increase dose rates both within the facility and in the community due to loss of convenient and inexpensive shielding. When other detriments (such as the increased potential for traffic accidents) are considered, the ALARA analysis recommends even more strongly against shipping the soil for disposal, as distinguished from allowing it to decay to inconsequence and using it constructively in the interim. Neutron submits that the funds it expends to dispose of RadWaste should be focused on shipping those items whose shipment will result in some benefit to members of the public or employees. The soil at issue does not constitute such material.

3.8 Nothing in this response implies that Neutron could not construct other shields to replace the contaminated soil if it were shipped offsite. However, the soil serves a useful purpose as shielding, and - based on its benign nature and the costs associated with its shipment - it is simply not ALARA to dispose of it.

3.9 That said, in order to attempt to satisfy what it considers to be unreasonable demands on the part of MDE, Neutron has been investigating disposal at Envirocare, as well as other options, regarding the possible shipment of contaminated soil and, in the event that becomes necessary or desirable, Neutron has provided for such shipments in its decommissioning plan. RHP's insinuations that unshipped RadWaste constitutes an ALARA violation are strongly contradicted by available data which indicates that both occupational and public exposure have been

significantly and more or less continuously reduced over the last 5 years pursuant to Neutron's much more viable approach to both ultimate decommissioning and interim waste disposal.

3.10 Similar to paragraph 1.9 of our response above, MDE was well aware that ALARA and other considerations ensured that Neutron would not be able to meet the requirements of License Condition 21 when it was written, so that when Item 2 was included in the November 3, 2000 Court Order, both MDE and Neutron were well aware that we would not be able to comply with some conditions in our license, thereby putting us in immediate violation of the Court Order.

Corrective Action

3.11 As you know, we will file an appeal with the Court of Special Appeals concerning the validity and appropriateness of this condition. We recognize this as a major point of contention between MDE and Neutron and we hereby repeat our request for a face to face meeting, preferably in the presence of mutually agreeable people from NRC and DBED, to attempt to explain our position, better understand your position, and hopefully resolve our differences. Recognizing that your inspectors are not authorized to change this condition, MDE top management should be present in order for the meeting to be most constructive. We have requested such a meeting several times in the past, and MDE has refused to participate. We hope you will reconsider your position in that regard.

3.12 At some point, the State of Maryland may well become as interested as Neutron in a truly viable approach to RadWaste Management and ultimate disposal. In that regard, we have presented a series of proposals, all arbitrarily rejected by MDE without well reasoned cause. Nevertheless, each of them were technically and economically viable in both the short term and long term, and were well designed to cope with the technical and economic uncertainties arising from the fact that the field of RadWaste management and disposal still lacks sound standards and effective competition for the safe and efficacious long term management and ultimate disposal of the type of RadWaste at issue between us.

3.13 Meanwhile, based upon inapplicable assumptions rather than a rational and clearly described plan of attack, your chosen consultants have proposed an inordinately expensive and destructive approach to the timely decommissioning of the facilities used under the 01 License; and have failed to consider and include much more viable alternatives. All things considered, we respectfully suggest that Neutron and MDE should approach the pending mediation as a way to work in the public interest to discuss practical ways and means of making our clearly more viable alternative acceptable to RHP or some other regulatory authority more constructively inclined.

Alleged Violation #4 states:

"4. Section C .29(c)(2) titled, 'Financial Assurance and Recordkeeping for

> Decommissioning' requires, in part, that each licensee who is a holder of a specific license issued before October 15, 1998 and of a type described in paragraph (a) of C.29 must submit, on or before October 15, 1998 a decommissioning funding plan or a certification of financial assurance for decommissioning in an amount of at least equal to $750,000. Also, the requirements of Section C.29(g)(2) requires that no person shall receive, possess, use, transfer, own, or acquire radioactive material of a type described in paragraphs (a) and (b) of C.29 for more than 180 days following the dates prescribed in the section for submittal of a decommissioning funding plan or certification, if the decommissioning funding plan or certification has not been approved by the Agency.
>
> Contrary to Section C.29(c)(2), NPI has not met the $750,000 certification by the specified dates of this regulation. Furthermore, NPI's decommissioning funding plan has not been approved by the Agency. Pursuant to NPI's failure to provide an adequate decommissioning funding plan or the $750,000 certification by April 13, 1999 (180 days post October 15, 1998) NPI has continued to receive, possess, use, transfer, own, or acquire radioactive material of a type described in paragraphs (a) after the 180 day (April 13,1999) deadline. NPI has been in continuous violation of this requirement since the November 1999 inspection. This violation was once again identified during the December 2001 Inspection, however Mr. Jackson Ransohoff failed to respond in writing as required by the March 21, 2002 Departmental Letter-Notice of Violation. Messrs. Jackson and Billy Ransohoff have refused to initiate the steps necessary to decommission the facility in a timely, safe and predictable manner."

Response

4.1 As MDE is well aware, its adamant refusal to adopt Appendix D prevented Neutron from complying with the financial assurance regulations, even though it had demonstrated the wherewithal to satisfy the financial strength requirements of the NRC's then newly adopted regulation.

4.2 Furthermore, had Neutron posted the required $750,000 deposit, MDE's arbitrary rejection of its $650,000 to $1.3 million Decommissioning Plan, combined with MDE's apparent adoption of its consultant's plan (estimated to cost $6.5 million to $21 million) would have enabled it to demand that Neutron post an additional $6 million to $20 million of cash equivalent funding assurance or forfeit its $750,000 deposit, a set of circumstances which clearly discourages the prospects of a bond issuance by any third party.

4.3 Regarding the decommissioning funding plan which has not been approved by the Agency, we submit that a face to face meeting to discuss the plan submitted by Neutron in October, 2000 is long overdue and we hereby request such a meeting, preferably including prospectively helpful third parties and MDE top management, so that we can better understand each other's position

and hopefully arrive at a practical course of action.

Corrective Action

4.4 Your statement that we have "refused to initiate the steps necessary to decommission the facility in a timely, safe and predictable manner" ignores the fact that we have executed the first two years of our decommissioning plan on schedule and slightly under budget. Our ability to continue to make progress on the decommissioning project has clearly been severely compromised by MDE's refusal to authorize us to continue all revenue-generating activities under the 01 License, and by MDE's stated intent to "prohibit continued profitable activities under the 01 License."

4.5 Under all of the circumstances, the best corrective action we can take is to continue our efforts to put the facility in a better position to be decommissioned and to put the company in a better position to perform that decommissioning (if, as and when it becomes necessary). Meanwhile, against all odds, we have continued to improve the radiological condition of the facility, and demonstrate our on-going ability to self assure with the hope that, at some point, MDE will work with us to benefit the public interest, as is required by common sense, all duly promulgated laws and regulations, and its pledge as part of the 1994 Settlement.

Alleged Violation #5 states:

"5 Section C31 titled, "Specific Terms and Conditions of Licenses" and License condition 21(B) prohibits NPI from storing radioactive waste in areas other than the main pool/canals for a period exceeding 2 years.

a the licensee stored a 12"x1.5" waste tube containing Argentine cladding (200 mR/hr dry) from January 2000 to July 2002, a time period greater than 2 years.
b The licensee stored approximately 600 cubic feet of soil contaminated with cobalt-60 from November 2000 to July 2002, a time period greater than 2 years.
c The licensee stored a 12"x1.5" waste tube (500 mR/hr in 3 ft. of water) from January 2000 to July 2002, a time period greater than 2 years.
d The licensee stored a 12"x1.5" waste tube (500 mR/hr @ 1 meter) a teletherapy waste from June 2000 to July 2002, a time period greater than 2 years.

Violations 5.a and 5.b were identified during the December 2001 Inspection, however Mr. Jackson Ransohoff failed to respond in writing as required by the March 21, 2002 Departmental Letter-Notice of Violation. These are also violations of the November 3, 2000 Montgomery County Circuit Court Order. Messrs. Jackson and Billy Ransohoff have refused to correct this violation and comply with this license condition and the Court

Order."

Response

5.1 As we have explained in the past, Neutron's highest activity waste gets encapsulated in stainless steel and is stored under water in the main pool. In this manner, it is safely stored and does not contribute materially to dose rates in the area, or to doses incurred by employees or members of the public. We refer to this encapsulated waste as a "waste tube". As such, items a, c, and d are stored in the main pool. License Condition 21 does not require them to be shipped for four years and these items do not, therefore, constitute a violation. Please see sections 3.4-3.6 above for a more thorough explanation of our position concerning the shipment of high activity RadWaste safely stored under water.

5.2 Concerning item b, the alleged violation states that the material was stored between November, 2000 and July, 2002. This is a period of 21 months, which is less than two years so that this does not represent a violation either. This is not to say that we do not have soil on-site which has been stored for more than 2 years. In that regard, please see sections 3.7-3.9 above for a more thorough explanation of our position concerning the shipment of contaminated soil.

5.3 Your assertion that we failed to respond to a similar violation in your letter of March 21, 2002 is also flawed. Section 8 of our response dated April 12, 2002 (on pages 5 and 6) is devoted to this same alleged violation.

Corrective Action

5.4 As discussed in section 3.5 above, we submit that License Condition 21 forces us to either violate our license, or violate ALARA. In this situation, we believe our primary responsibility is to ALARA, which charges us with the responsibility to protect our employees from incurring significant, unnecessary occupational exposure and to protect the company from incurring a significant, unnecessary financial burden ALARA, unless such burdens can be justified by an offsetting benefit to the public health, employee safety or the environment. We will continue to manage our RadWaste responsibly and will continue to administer our ALARA Program in accordance with the clear intent of the regulations and relevant written guidance, such as NUREG 1530.

Alleged Violations #6 and #7 state:

"6 Section D.1001 titled, "Waste Disposal-General Requirements" prohibits a licensee from disposing licensed radioactive material by transferring it to an unauthorized recipient. Section C.40 titled, "Transfer of Material" prohibits a licensee from transferring licensed radioactive material to an unauthorized recipient.

Contrary to the requirement of Section D.1001 and C.40, on June 27, 2002 NPI transferred approximately 12 microcuries of cobalt-60 to the Montgomery County Waste Transfer Station in Rockville, Maryland. Apparently, NPI employees inadvertently disposed a plastic bag containing approximately 12 microcuries of cobalt-60 into a roll off refuse container. The container was sent to the Transfer Station where it set off the radiation alarms."

"7 Section D.501 titled, "Surveys and Monitoring-General" requires a licensee to conduct surveys that are necessary to comply with regulatory requirements and to evaluate radiation levels, concentrations of radioactive materials and the potential radiological hazards that could be present.

Contrary to the requirements of Section D.501, the licensee failed to conduct an adequate radiological survey of a plastic bag containing approximately 12 microcuries of cobalt-60, prior to releasing it into a roll off container filled with regular waste and located in an unrestricted area. Furthermore, the licensee failed to conduct an adequate radiological survey of the roll off container prior to being sent to the Montgomery County Waste Transfer Station in Rockville, Maryland where it tripped the radiation alarms."

Response

6.1 Our investigation following this incident determined that our failure to detect the radiation in the roll-off container had two primary causes:

- the individual who surveyed the bag before removing it from the LAA did so in an area with higher than desirable levels of background radiation using a survey meter which was not optimum for the task; and,

- management failed to rigorously enforce a system to ensure that health physics personnel conduct a survey before the roll-off is removed from the site so that, in this case, the roll-off was picked up at a time after our health physics technicians had left for the day and the roll-off itself was not surveyed.

6.2 In evaluating the relative hazard of this incident, it is instructive to note that, since the new detection system has been installed at the County transfer station, they have experienced nearly one incident per day, primarily involving isotopes of iodine, and that based on MDE instructions (and the detection capabilities of the transfer station), they do not even look for americium-241, lead-210 - polonium-210, which are much more lethal and long-lived than cobalt-60. In nearly all of these other cases, the contaminated trash was transferred to the incinerator, where it was burned and released to the environment. We are not claiming that the incineration of small quantities of iodine constitutes a serious environmental hazard, but it does provide some

perspective when evaluating the hazard created by the small amount of contamination contained in Neutron's roll-off. Clearly, this does not excuse the release of the material from the LAA in any way.

6.3 Because of the low radiation levels involved, no one received (or was likely to receive) any exposure distinguishable above background as a result of this incident. While at the transfer station, Mr. Jacobson surveyed the driver's cab and found the dose rate therein to be equivalent to background.

Corrective Action

6.4 As you are aware, we recovered the plastic bag on the same day and added it to our RadWaste in inventory. Mr. Nelson surveyed the roll-off after the bag was removed and confirmed the results of our own survey which showed radiation levels around the roll-off to be at background. Although there was no damage to persons, property or the environment as a result of this incident, it clearly should not have happened and we have taken measures designed to prevent its recurrence.

6.5 We sent a letter to MDE on July 24, with attachments, which reported on our investigation of the incident and forwarded the draft of a new procedure regarding the survey and release of refuse. We have largely implemented the procedure, but have not yet finalized it pending your comments. As we would like to finalize this procedure by September 15, we would appreciate getting your comments before then.

Concern #1 states:

> "Inspection findings indicate the NPI does not have the technical expertise, financial resources and management commitment to decommission the Limited Access Area in a timely, safe and predictable manner as required."

Response

C1.1 As you are aware, we have prepared an On-Line Decommissioning Plan which is a practical means to decommission our 01 Licensed facility. Thusfar, we have demonstrated the viability of the Plan, and our ability to perform on it, by completing its first two years on schedule and slightly under budget. Based upon our more than 40 years of experience in the business, we clearly have the technical expertise and management commitment to perform the project and, if authorized to proceed as necessary, we will have the financial resources as well.

C1.2 However, if MDE persists on its current course, it will be virtually impossible for Neutron to perform. For example, MDE's self-stated regulatory objective "to prohibit continued profitable

activities under the 01 License" has made it very difficult for Neutron to generate the "financial resources" necessary. Similarly, MDE's practicing definition of ALARA to mean "as low as possible" will make it very difficult to satisfy MDE's definition of a decommissioned facility.

Corrective Action

C1.3 We will continue to attempt to act constructively in the face of the current adversity.

Concern #2 states:

> "The front gate to the plant was unsecured on June 24, 2002. The electronic lock had broken for several days, however it was not repaired or reported to the Radiation Safety Officer or the Plant Manager."

Response

C2.1 As you know, the automatic gate is a relatively new feature at Neutron. Management was aware of some problems with the gate at the time of your inspection and had directed the maintenance shop to make repairs. The new gear box had been ordered and was installed soon after your visit.

Additional Corrective Action

C2.2 In addition, a brake has been installed on the motor and a new, more rugged gate has been fabricated and installed.

Concern #3 states:

> "The inspection team identified numerous violations of the November 3, 2000 Montgomery County Circuit Court Order."

Response

C3.1 We take our obligations to observe all Court Orders very seriously. For specific information, please see our responses to Alleged Violations 1, 2, 3, and 5.

Concern #4 states:

> "NPI continues to release radioactive materials into the environment in an uncontrolled manner."

Response

C4.1 As you know, Neutron's facility is not a zero-release facility, nor was it designed to be one, nor is it practical to make it one, nor is there a public health, safety, or environmental reason to make it one. When MDE sought advice from NRC on this matter, the NRC responded by letter dated January 4, 1994 that:

> "It is recognized that depending on a particular licensee operation, there may be some radioactive material which leaves the confines of a restricted area through pathways which are not continuously monitored", and that such releases should be "evaluated on their own merits".

C4.2 MDE representatives have informed us that no such evaluation has been performed. Conversely, we have performed several evaluations and each time determined that the highest credible exposure to any member of the public as a result of Neutron's off-site contamination is about 2 mrem/year, or a mere 2% of the regulatory limit.

C4.3 An evaluation of the dose rate, in comparison to regulatory limits, demonstrates a comparable margin of compliance. The highest dose rate in the area is on the order of 40 μrem/hr above natural background. This is also 2% of the regulatory limit of 2 mrem/hr for any unrestricted area.

C4.4 Similarly, we have evaluated the amount of contamination leaving the LAA in an "uncontrolled manner" and determined that approximately 1-2 mCi/year gets washed out of the courtyard. We collect the vast majority of this in the stone trap and dry pond, so that actual off-site releases from stormwater run-off constitute approximately 25-40 μCi/year. Another way to look at the potential hazard of these releases is to examine what is considered acceptable for our "controlled releases".

1. LAA Ventilation System - Assuming airflow of 960 cfm, and using the effluent concentration value for Class Y cobalt-60 in air (5×10^{-11} μCi/cc) contained in COMAR 26.12.01.01 Part D, Table 2, a straight calculation shows that a total release of approximately 900 μCi/year would still be within this regulatory guidance (this calculation does not account for dose considerations for members of the public). Our actual release for 2001 was approximately 4 μCi.

   In order to evaluate the potential hazard of our "uncontrolled release" of 25-40 μCi in stormwater, consider the fact that, if that same amount were instead released to the air through the ventilation system, it would be well within limits and would not be considered an undue hazard.

2. Similarly, the concentration limit for sewage released from our facility is 3×10^{-5} μCi/cc. Averaging approximately 9 truckloads per month (which is what we shipped in 2001) at this concentration would result in a total release of approximately 37 mCi of activity. Our actual releases only totaled about 6 mCi (6,000 μCi).

   Again, for the purposes of evaluating the hazard of our "uncontrolled release" of 25-40 μCi/year, this represents only approximately one tenth of one percent of the permissible level of 37 mCi (37,000 μCi) / year for releases to the sewer.

Unfortunately, instead of performing an objective evaluation as recommended in NRC's January 1994 letter, MDE has used this small amount of contamination to create great alarm among some of our neighbors and the body politic.

C4.5 Furthermore, instead of conducting an evaluation of its own, or evaluating the flaws of Neutron's evaluation, MDE has recently called in the ATSDR of the Center for Disease Control to conduct an assessment of the potential hazards. Predictably, the ATSDR findings state that "... based on observations of population estimates, levels of radiation exposure surrounding the facility (off-site), and no uniform off-site contamination, I do not believe the current site conditions pose any threat to human health."

C4.6 Clearly, uncontrolled releases such as the roll-off incident discussed in Alleged Violations #6 and 7 require a different type of evaluation and different corrective action, as described in the Response to those violations above.

Corrective Action

C4.7 Our corrective action is described in sections 1.10-1.14 and 6.3-6.5 of this response.

Concern #5 states:

> "Dickerson residents living near the plant are exposed to unnecessary levels of radiation caused by radioactive waste stored on site. NPI has missed several waste shipment deadlines. In fact, NPI has not shipped radioactive waste for disposal in over a year."

Response

This concern was addressed in conjunction with Alleged Violation #3 above.

Concern #6 states:

"NPI has still not submitted an adequate decommissioning plan or waste disposal plan."

Response

This concern was addressed in conjunction with Alleged Violation #3 above.

Concern #7 states:

"NPI's Health Physics consultant has not been effective in correcting ongoing violations and concerns. The vast majority of these violations and concerns have not been recently addressed in his monthly radiation protection audits. These audits often address issues unrelated to problems at the Dickerson facility and provide only minimal improvement to the radiation safety program at NPI."

Response

C7.1 We submit that one of the functions of the health physics consultant should be to bring a fresh perspective to our operations. As such, we believe it is important to allow him or her to focus on items which he or she finds important.

C7.2 We further submit that this "concern" of MDE's is rife with contradictions:

1. On the one hand, MDE asserts that Mr. Alexander serves limited purpose, and on the other hand, MDE uses the findings in one of his recent reports to justify bringing a MOSH inspector to the facility. (As a result of that inspection, the MOSH inspector did not cite Neutron for Mr. Alexander's concern, but did find a separate violation which was promptly corrected.) Clearly, MDE finds some value in Mr. Alexander's findings.

2. On the one hand, MDE limits who Neutron can use as a health physics consultant and how he can be used (by mandating that he conduct certain specific activities which may not be his strength), thereby denying Neutron the flexibility necessary to gain the full benefit of a health physics consulting program, and then claims to be "concerned" that Neutron is not benefitting from the program.

3. On the one hand, MDE is "concerned" that the health physics consultant has not solved Neutron's on-going violations (presumably, such as the soil contamination), while on the other hand refusing to consider any scientific evaluation which shows that these violations do not represent significant health and safety concerns. We cannot force any competent health physicist to focus on a "problem" which competent evaluation shows doesn't exist. Instead, Mr. Alexander focuses on

problems which he perceives do exist. For example, his latest report discusses the recent resin change for the north canal system. Mr. Alexander documented a concern shared and previously discussed with LAA staff and Neutron management concerning the north canal resin bottle, which represented a significant source within one portion of the LAA. The corrective action performed and documented in Mr. Alexander's report involved plumbing modifications to provide additional shielding. This will result in reduced background levels within the LAA and will ultimately reduce occupational exposures. Clearly, this is the type of project on which the health physics consultant should be focused.

C7.3 This is not to say that we are completely satisfied with Mr. Alexander's services. However, MDE severely limits the potential of our program by the prescriptive nature of its license conditions.

Corrective Action

C7.4 We hereby request that MDE modify license condition 16 to simply say:

> "Neutron is required to use a Certified Health Physicist to periodically review its operations and to conduct appropriate training once per calendar quarter."

Concern #8 states:

> "During the December 2001 Inspection, the RHP identified poor radioactive waste storage practices such as waste stored in plastic bags instead of drums. Results from the June 2002 inspection conclude that these poor radioactive waste storage practices remain uncorrected."

Response

C8.1 As MDE is aware, the field of RadWaste disposal is very uncertain and in a constant state of flux. For example, in the early stages of preparing our previous waste shipment, we were intending to send the waste directly for disposal, so the economic incentives were to compact the waste in drums. However, we subsequently became aware of an alternative process wherein the waste underwent thermal oxidation. That particular processor preferred to have the waste uncompacted.

C8.2 As a result of that experience, the Radiation Safety Committee decided to leave the waste in its original form until we had planned for its disposal. In this manner, we would not incur occupational exposure performing waste processing activities (such as compaction) which were not necessary. In cases where our RadWaste is stored in plastic bags, it is important to recognize

that the bags are, themselves stored in at least one metal container. For example, we have plastic bags inside steel innerpacks, which provide structural integrity, better containment and some degree of protection against fire.

C8.3 As such, we do not believe this to be a "poor radioactive waste storage practice" and are not contemplating any corrective action at this time.

Closing

I trust that you will find this reply to be totally responsive to your letter. If, however, you require additional information or wish to discuss any of this, please give me a call.

Very truly yours,

Neutron Products, inc.

J. A. Ransohoff, JR

J.A. Ransohoff
President

Sheri Minnick

08/22/02 03:00 PM

To: Christine Wagner/R3/USEPA/US@EPA, Lorie Baker/R3/USEPA/US@EPA, Dennis Matlock/R3/USEPA/US@EPA
cc:
Subject: Health advisory is NOT warranted

FYI, I asked Pete to forward me ATSDR's opinion on Neutron Products.

----- Forwarded by Sheri Minnick/R3/USEPA/US on 08/22/2002 02:59 PM -----

Peter Gold

08/22/2002 02:42 PM

To: Sheri Minnick/R3/USEPA/US@EPA
cc:
Subject: Health advisory is NOT warranted

Please see the attached. Thanks
----- Forwarded by Peter Gold/R3/USEPA/US on 08/22/02 02:41 PM -----

"Charp, Paul" <pac4@cdc.gov>

08/16/02 08:49 AM

To: "Williams, Robert C. (Bob)" <rcw1@cdc.gov>, "Isaacs, Sandra (Sandy) G" <Sgi1@cdc.gov>
cc: Tom Stukas/R3/USEPA/US@EPA, Peter Gold/R3/USEPA/US@EPA
Subject: Health advisory is NOT warranted

I have returned from the Neutron Products site visit where I met with ATSDR regional staff, EPA, state, and facility representatives. The site is in a rural area with less than 20 houses within a kilometer of the facility. The closest residences are either owned by the facility or are vacant. The EPA is considering listing the site but the Site Assessment Manger does not believe the facility will score high enough to trigger listing the site.

We performed radiological surveys and collected environmental samples around the facility property and off-site areas. ATSDR assisted in the surveys, identification of sampling locations, and collection of samples. The radiation levels 200 yards from the facility are indistinguishable from background; any elevated radiation readings are from the waste stored on site. Per conversations with the state, Neutron Products is under a court order to remove the waste but no action has been taken as yet. The site releases about 6 microcuries of cobalt 60 per year; this is within regulatory limits. Any air releases are in the form of metallic cobalt and the resulting contamination is particulate (hot spots).

In a nutshell, based on observations of population estimates, levels of radiation exposure surrounding the facility (off-site), and no uniform off-site contamination, I do not believe the current site conditions pose any threat to human health. No off-site soil contamination was found that exceeded the DHAC soil screening criteria; in fact no contaminated areas were found off-site.

If you would like a more detailed report, please let me know.

Thank you

Paul A. Charp, Ph.D.
Senior Health Physicist
Division of Health Assessment and Consultation
CDC/ATSDR
1600 Clifton Road E 56
Atlanta, Georgia 30333
404 498 0365

U.S. Environmental Protection Agency

Resource Conservation and Recovery Act (RCRAInfo)

Query Results

Report Error

RCRAInfo

Consolidated facility information (from multiple EPA systems) was searched to select facilities

name: Beginning With: Neutron Products

Results are based on data extı
Note: Click on the underlinec vironmental
web pages.
Click on the underlined MAP Lorie, acility.

Go To Bottom Of The Page

HANDLER NAME:	NEUTRON INCORPOR	2644385
STREET:	22301 MOU	acility Information
CITY:	DICKERSO	
STATE:	MD	GOMERY
ZIP CODE:	20842	MAP
EPA REGION:	3	

Attached is some information I obtained from the RCRA website regarding Neutron Products.

Thanks

CONTACT INFORMATION

NAME	STREE	TYPE OF ORMATION
WILLIAMS JEFFREY	22301 MT EPHRAIM R	Permit
WILLIAMS JEFFREY	22301 MT EPHRAIM R	tion

LIST OF SIC CODES ANI

SIC CODE	
2819	INDUSTRIAL
2869	INDUSTRIAL
2899	CHEMICALS AND

Go To Top Of The Page

Total Number of Facilities Displayed: 1

U.S. Environmental Protection Agency

Toxics Release Inventory (TRI)

Envirofacts Report

TRI

Query executed on AUG-21-2002
Results are based on data extracted on MAY-23-2002

Click on "View Facility Information" to view EPA Facility information for the facility.

Facility Name:	NEUTRON PRODS. INC.	Mailing Name:	NEUTRON PRODS. INC.
Address:	22301 MOUNT EPHRAIM RD. DICKERSON MD 208420068	Mailing Address:	P.O. BOX 68 DICKERSON MD 20842-0068
County:	MONTGOMERY	Region:	3
Facility Information:	View Facility Information	TRI ID:	20842NTRNP22301
TRI Preferred Latitude:	39.216667	TRI Preferred Longitude:	77.416667
Public Contact:		Phone:	
Parent Company:	NA	Parent DUNS:	NA

SIC Codes for 2000

SIC CODE	SIC DESCRIPTION
2819	INDUSTRIAL INORGANIC CHEMICALS, NOT ELSEWHERE CLASSIFIED
2899	CHEMICALS AND CHEMICAL PREPARATIONS, NOT ELSEWHERE CLASSIFIED

The above information comes from 2000, which is the latest reporting year on file for this facility. The earl facility is 1987.

Map this facility

Map this facility using one of Envirofact's mapping utilities.

Besides TRI, this facility also does the following:

- has reported air releases under the Clean Air Act
- has a current or archived Superfund Site Report

More information about these additional regulatory aspects of this facility can be found by pressing the

Other Regulatory Data

Total Aggregate Releases of TRI Chemicals to the Environment:

*For all releases estimated as a range, the mid-point of the range was used in these calculations. This table summ facility. **NR** - signifies nothing reported by this facility for the corresponding medium.*

Total Aggregate Releases of TRI Chemicals excluding Dioxin and Dioxin-lik (Measured in Pounds)

Media	2000	1999	1998	1997	1996	1995	1994	1993	1992	1991	19
Air Emissions	255	255	255	255	NR	755	755	505	510	1000	7
Surface Water Discharges	NR	NR	NR	0	NR	NR	NR	NR	NR	NR	
Releases to Land	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
Underground Injection	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
Total On-Site Releases	255	255	255	255	NR	755	755	505	510	1000	7
Transfer Off-Site to Disposal	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	86
Total Releases	255	255	255	255	NR	755	755	505	510	1000	93

Graphic Summary of this Table

Total Aggregate Releases of Dioxin and Dioxin-like Compounds (Measured in Grams)

Media	2000	1999	1998	1997	1996	1995	1994	1993	1992	1991	19
Air Emissions	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
Surface Water Discharges	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
Releases to Land	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
Underground Injection	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
Total On-Site Releases	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
Transfer Off-Site to Disposal	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
Total Releases	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	

Graphic Summary of this Table

TRI Chemicals Reported on Form A:

The facility has certified that for each chemical listed below, the annual release did not exeed 500 pounds for the chemical was not manufactured, processed, or otherwise used in an amount exceeding 1 million pounds in the re PBT chemicals (except certain instances of reporting lead in stainless steel, brass, or bronze alloys).

Chemical Name	TRI Chemical ID	2000	1999	1998	1997	1995	1994	1993	1992	1
ACRYLIC ACID	000079107	Reported	Reported	Reported	Reported	Not Reported	Not Reported	Not Reported	Not Reported	Not Rep

NOTE:
All chemicals reported below have release or transfer amounts greater than zero. To see a list of all ch here.

Names and Amounts of Chemicals Released to the Environment by Year.

*For all releases estimated as a range, the mid-point of the range was used in these calculations. **NR** - si facility by the corresponding medium. Rows with all "0" or "NR" values were not listed.*

Chemical Name	Media	Unit Of Measure	2000	1999	1998	1997	1996	1995	1994	19
ACRYLAMIDE (TRI Chemical ID: 000079061)	AIR FUG	Pounds	5	5	5	5	NR	250	250	
ACRYLAMIDE (TRI Chemical ID: 000079061)	AIR STACK	Pounds	250	250	250	250	NR	250	250	2
ACRYLAMIDE (TRI Chemical ID: 000079061)	DISP NON METALS	Pounds	NR	NR	NR	NR	NR	NR	NR	
ACRYLIC ACID (TRI Chemical ID: 000079107)	AIR FUG	Pounds	NR	NR	NR	NR	NR	5	5	2
ACRYLIC ACID (TRI Chemical ID: 000079107)	AIR STACK	Pounds	NR	NR	NR	NR	NR	250	250	
FORMALDEHYDE (TRI Chemical ID: 000050000)	AIR FUG	Pounds	NR	NR	NR	NR	NR	NR	NR	
FORMALDEHYDE (TRI Chemical ID: 000050000)	AIR STACK	Pounds	NR	NR	NR	NR	NR	NR	NR	
SODIUM HYDROXIDE (SOLUTION) (TRI Chemical ID: 001310732)	AIR FUG	Pounds	NR	NR	NR	NR	NR	NR	NR	

Discharge of Chemicals into Streams or Bodies of Water:

Please note that either there were no releases of chemicals into streams or bodies of water reported by file a TRI form R for the years 1987 to 2000. Rows with Release Amount equal to "0" were not listed.

Transfer of Chemicals to Off-Site Locations other than POTWs:

Please note that transfer amounts are not included in release totals shown above. For all releases estim the range was used in these calculations. Rows with Total Transfer Amount equal to "0" were not listed

Chemical Name	Year	Unit Of Measure	Total Transfer Amount	Transfer Site Name and Address
ACRYLAMIDE (TRI Chemical ID: 000079061)	1997	Pounds	275	CLEAN HARBORS OF BALTIMORE INC 1910 RUSSELL ST. BALTIMORE, MD 21230
ACRYLAMIDE (TRI Chemical ID: 000079061)	1995	Pounds	2240	CLEAN HARBORS OF BALTIMORE IN, C. 1910 RUSSEL ST. BALTIMORE, MD 21230
ACRYLAMIDE (TRI Chemical ID: 000079061)	1994	Pounds	3345	CLEAN HARBORS OF BALTIMORE IN, C. 1910 RUSSEL ST. BALTIMORE, MD 21230
ACRYLAMIDE (TRI Chemical ID: 000079061)	1993	Pounds	3000	CLEAN HARBORS OF BALTIMORE IN, C. 1910 RUSSEL ST. BALTIMORE, MD 21230
ACRYLAMIDE (TRI Chemical ID: 000079061)	1993	Pounds	3500	DUPONT CHEMICAL CO. CHAMBERSWORKS DEEP WATER, NJ 08023
ACRYLAMIDE (TRI Chemical ID: 000079061)	1992	Pounds	2445	DUPONT CHEMICAL CO. CHAMBERSWORK DEEPWATER, NJ 08023
ACRYLAMIDE (TRI Chemical ID: 000079061)	1992	Pounds	4890	CLEAN HARBOURS OF BALTIMORE, MD 1910 RUSSELL ST. BALTIMORE, MD 21230
ACRYLAMIDE (TRI Chemical ID: 000079061)	1991	Pounds	8947	DUPONT CHEMICAL CO. CHAMBERSWORK DEEP WATER, NJ 08023
ACRYLAMIDE (TRI Chemical ID: 000079061)	1991	Pounds	8947	DUPONT CHEMICAL CO. CHAMBERSWORK DEEP WATER, NJ 08023
ACRYLAMIDE (TRI Chemical ID: 000079061)	1990	Pounds	8600	DUPONT CHEMICAL CO. CHAMBERSWORK DEEPWATER, NJ 08023
ACRYLAMIDE (TRI Chemical ID: 000079061)	1989	Pounds	9600	DUPONT CHEMICAL CO. CHAMBERS WORK DEEPWATER, NJ 08023
ACRYLAMIDE (TRI Chemical ID: 000079061)	1987	Pounds	6400	DU-PONT CHEMICAL CO. CHAMBERSWORK DEEP WATER, NJ 08023

Summary of Waste Management Activites

Please note that chemical amounts shown here are not included in Total Aggregate Releases shown ab

Summary of Waste Management Activites excluding Dioxin and Dioxin-like (Measured in Pounds)

Year	On-Site Recycling	Off-Site Recycling	On-Site Energy Recovery	Off-Site Energy Recovery	On-Site Treatment	T
1999	0	0	0	0	0	
2000	0	0	0	0	0	
2001 (Projected)	0	0	0	0	0	
2002 (Projected)	0	0	0	0	0	

Summary of Waste Management Activites for Dioxin and Dioxin-like Co (Measured in Grams)

This facility did not report any waste management activites for Dioxin and Dioxin-like Compounds.

Chemicals Under Waste Management:

Please note that chemical amounts shown here are not included in the Total Aggregate Releases shown Treatment Works are listed on a seperate table.

Chemical Name	Year	Unit Of Measure	On-Site Recycling	Off-Site Recycling	On-Site Energy Recovery	Off-Site Energy Recover
ACRYLAMIDE	1999	Pounds	0	0	0	
	2000	Pounds	0	0	0	
	2001 (Projected)	Pounds	0	0	0	
	2002 (Projected)	Pounds	0	0	0	

Transfer of Chemicals to Publicly Owned Treatment Works (POTW):

Please note that transfer amounts are not included in the Total Aggregate Releases shown above. For a mid-point of the range was used in these calculations.

Chemical Name	Year	Unit Of Measure	Total Transfer Amount
ACRYLAMIDE	1997	Pounds	1600
ACRYLAMIDE	1998	Pounds	1275
ACRYLAMIDE	1999	Pounds	1100
ACRYLAMIDE	2000	Pounds	1090

Publicly Owned Treatment Works (POTW) that Chemicals were Transferred to:

Chemical Name	Year	POTW Name and Address
ACRYLAMIDE	1997	LEHIGH COUNTY WASTEWATER, PRETREATMENT 7676 INDUSTRIAL BLVD. ALLENTOWN, PA 18102
ACRYLAMIDE	1998	LEHIGH COUNTY WWTP 7676 INDUSTRIAL BLVD ALLENTOWN, PA 18102
ACRYLAMIDE	1999	LEHIGH COUNTY WWTP 7676 INDUSTRIAL BLVD ALLENTOWN, PA 18102
ACRYLAMIDE	2000	LEHIGH COUNTY WWTP 7676 INDUSTRIAL BLVD ALLENTOWN, PA 18102

Non Production Releases:

This facility did not report any Non-Production releases.

The Environmental Defense Fund's (EDF) Chemical Scorecard has on-line environmental information regarding t
EXIT EPA facility's reported TRI releases. This information resource is not maintained, managed, or owned by the
(EPA) or the Envirofacts Support Team. Neither the EPA nor the Envirofacts Support Team is responsible for thei
Envirofacts Warehouse provides this reference only as a convenience to our Internet users.

OSHA comments from the January 19, 1989 Final Rule on Air Contaminants Project extracted from 54FR2332 et. seq. This rule was remanded by the U.S. Circuit Court of Appeals and the limits are not currently in force.

ACRYLAMIDE

CAS: 79-06-1; Chemical Formula: CH_2=$CHCONH_2$

The former OSHA 8-hour TWA permissible exposure limit for acrylamide was 0.3 mg/m^3, with a skin notation, and the Agency proposed a revised PEL of 0.03 mg/m^3, with a skin notation, for this substance, based on evidence of its carcinogenicity in animals. NIOSH (Ex. 8-47, Table N6A) concurs that these limits are appropriate for acrylamide. The ACGIH recommends a TLV of 0.03 mg/m^3 for this substance (ACGIH 1986/Ex. 1-3, p. 12). The final rule promulgates an 8-hour TWA PEL of 0.03 mg/m^3, with a skin notation, for acrylamide.

Acrylamide is a white solid and is widely used as a reactive monomer or intermediate in organic synthesis, and polyacrylamide is a polymer that is used in the manufacture of a host of products, including adhesives, mining chemicals, fibers, pharmaceuticals, animal feed, paper sizing, molded parts, textiles, and coagulant aids (American Cyanamid Company, Ex. 94; ACGIH 1986/Ex. 1-3, p. 12). Chronic exposure to acrylamide has been associated with neurotoxic effects in animals and humans; in cats, the no-effect dose level for neurotoxic effects ranges from 0.3 to 1.0 mg/kg/day (ACGIH 1986/Ex. 1-3, p. 12). Neuropathic effects caused by exposure to acrylamide are dose-related and have been seen in rats, cats, and monkeys. Observed effects in humans included muscular weakening, ataxia, incoordination, tremors, and hallucinations. Acrylamide can be absorbed through the skin in sufficient quantities to be systemically toxic; the dermal LDLo in rabbits is 1000 mg/kg (RTECS 1988).

Tests on the mutagenicity of acrylamide have produced conflicting results (ACGIH 1986/Ex. 1-3, p. 12). However, acrylamide is associated with reproductive effects; based on a drinking water study by Smith, Zenick, Preston et al. (1986/Ex. 1-1123), OSHA concluded that acrylamide causes dominant lethality in the male rat (53 FR 21191).

Two studies are available that demonstrate the carcinogenicity of acrylamide: Johnson, Gorzinsky, Bodner et al. (1986/Ex. 1-825) and Bull, Robinson, Laurie et al. (1984/Ex. 1-252). OSHA described both of these studies in the preamble to the proposed rule (53 FR 21191); they are briefly summarized here. In the Bull et al. (1984/Ex. 1-252) study, acrylamide was tested as a skin tumor initiator in female Sencar mice; 12-o-tetradecanoylphorbol-13-acetate (TPA) was used as a promoter. The authors administered six doses ranging from 0 to 50 mg/kg body weight over a two-week period. A dose-related increase in tumor incidence was observed for all routes of exposure tested, including topical, gastric intubation, and intraperitoneal injection. The same authors (Bull, Robinson, Laurie et al. 1986/Ex. 1-252) noted a dose-related increase in lung adenomas in A/J mice administered acrylamide either by gastric intubation or intraperitoneal injection.

The second study was performed by Johnson et al. (1986/Ex. 1-825) on male and female Fischer 344 rats given 0 to 2.0 mg/kg/day acrylamide in drinking water for a period of two years. During the last four months of this study, mortality from cancer was observed at a statistically significant rate in rats exposed at the highest dose level; in addition, tumor incidence increased in animals of both sexes in the highest dose group. In females, tumors of the mammary gland, central nervous system, thyroid gland, oral tissues, uterus, and clitoral gland were seen, while males developed tumors of the central nervous system, thyroid, adrenal gland, and scrotum (Johnson, Gorzinsky, Bodner et al. 1986/Ex. 1-825). Peripheral nerve degeneration was also seen in female rats exposed at the 2 mg/kg/day level (ACGIH 1986/Ex. 1-3, p. 13).

OSHA received comments on the proposed limit for acrylamide from NIOSH and from one other

rulemaking participant. Linda Dulak, Toxicology Program Manager for the American Cyanamid Company, submitted a detailed critique of OSHA's discussion (53 FR 21191) of acrylamide's carcinogenicity (Ex. 94). According to Dr. Dulak: (1) the Johnson et al. (1986/Ex. 1-825) study described above is "inconclusive" with regard to acrylamide's carcinogenicity; (2) the Bull et al. (1984/Ex. 1-252) study demonstrates only that acrylamide is not a "complete" carcinogen; (3) OSHA has not demonstrated that the risk of exposure to acrylamide at the former PEL of 0.3 mg/m^3 is significant; and (4) OSHA has not demonstrated that it is feasible, either technologically or economically, to achieve the proposed 0.03 mg/m^3 limit (Ex. 94). The paragraphs below discuss each of these points in turn. Dr. Dulak believes that the results of the Johnson et al. (1986/Ex. 1-825) study should be regarded as "inconclusive" because (1) the presence of a viral infection in the animals of all dose groups "complicates the evaluation of the data"; (2) The highest dose administered was toxic to female rats; and (3) there were high background incidences of tumors among the controls (Ex. 94, p. 6). In addition, American Cyanamid states that the Bull et al. (1984/Ex. 1-252) study demonstrates only that acrylamide is not a complete carcinogen because animals administered acrylamide alone did not develop skin tumors (Ex. 94, p. 8). Dr. Dulak reported that American Cyanamid is currently conducting a second carcinogenicity study designed to clarify the questions that arose during the Johnson et al. (1986/Ex. 1-825) study, and preliminary review suggests that these results will differ significantly from those of the early study (Ex. 94, pp. 6-8). Dr. Dulak notes that the ACGIH is planning to review the expanded toxicological data base for acrylamide in the fall of 1988 and that the Food and Drug Administration and the Science Advisory Board of EPA are preparing to review the second American Cyanamid study when it becomes available (Exs. 3-961 and 8-76; Ex. 94, pp. 2-3). OSHA's response to Dr. Dulak's comments follows.

First, as regards the Bull et al. (1984/Ex. 1-252) study, prudent public-health policy dictates that all carcinogens, rather than only complete carcinogens, be regulated to levels that will provide worker protection. Second, OSHA notes that the authors of the Bull et al. (1984/Ex. 1-252) study are of the opinion that the potency of acrylamide as a tumor initiator is equal to that of ethyl carbamate, a widely recognized tumorigen (Klaasen, Amdur, and Doull 1986/Ex. 1-99, p. 123); in addition, these authors demonstrated that mice of a different strain (i.e., A/J mice) developed lung adenomas when given acrylamide by gastric intubation or intraperitoneal injection. Third, OSHA finds the Bull et al. (1984/Ex. 1-252) study, which showed a dose-related increase in skin tumors in one strain of mouse by three different routes of exposure and the development of lung tumors in another strain of mouse by two routes of administration, convincing evidence of acrylamide's carcinogenicity. OSHA looks forward to reviewing both the results of American Cyanamid's second study and the ACGIH TLV Committee's comments on acrylamide when these become available. However, the risk demonstrated by OSHA's risk assessment for acrylamide indicates that delaying regulatory action until additional research has been done would be inappropriate; further, it is the Agency's experience that research results are often not published for several years and that the deliberations of the ACGIH Committee are often time-consuming. OSHA finds it inappropriate to delay action when the best available evidence at present indicates a significant risk at the former PEL. Further, OSHA notes that the ACGIH was sufficiently persuaded of acrylamide's carcinogenicity by the findings of the Bull et al. (1984/Ex. 1-252) and Johnson et al. (1986/Ex. 1-825) studies to assign this substance an A2 (suspected human carcinogen) designation. The International Agency for Research on Cancer (IARC) was also convinced by the evidence presented in these studies; IARC judged that the evidence for the carcinogenicity of acrylamide in animals was sufficient (IARC 1986). However, in light of the ongoing research being conducted by American Cyanamid, OSHA will consider new evidence as it becomes available and will revise its limit if this action appears to be warranted.

In response to Dr. Dulak's third point (that, in American Cyanamid's view, OSHA has not demonstrated that risk at the former PEL of 0.3 mg/m^3 is significant), OSHA points to the results of the Agency's quantitative risk assessment, which show that the maximum likelihood estimate of the risk at the former PEL of 0.3 mg/m^3 is 10 cancer deaths per 1,000 workers exposed at that level over their working lifetimes (Table C15-2).

American Cyanamid believes that both the recent epidemiological findings of Sobel, Bond, Parsons, and Brenner (1986, as cited in Ex. 94) in a cohort mortality study of Dow Chemical Company

acrylamide-exposed workers and additional results from a more recent mortality study (Collins et al. 1987/Ex. 3-961) of America Cyanamid's workers show that "acrylamide is not carcinogenic to people" (Ex. 94, pp. 9-10).

Dr. Dulak discussed the Collins et al. study (1987/ Ex. 3-961, Appendix V) at length in posthearing comment:

> It was determined that the study was large enough to detect the increased risk of cancer which OSHA has indicated would occur at present exposure limits. These findings, therefore, indicate that OSHA has overestimated the risk of cancer among acrylamide workers at the present PEL (Ex. 94, p. 9).

OSHA does not agree that its quantitative risk assessment is inconsistent with the findings of the Collins et al. (1987) study. These investigators reported that the average cumulative exposures (defined as mg/m^3-years, the product of airborne concentration and duration of exposure) for each of the four subcohort plants included in the study ranged from 0.07 to 1.54 mg/m^3-years, with an overall average of 1.0 mg/m^3-years. This cumulative exposure corresponds to a 45-year exposure to 0.02 mg/m^3; at this level of exposure, OSHA's risk assessment shows that the excess lifetime cancer risk is less than one death per 1,000 workers. Thus, at the levels and durations of exposure experienced by the cohort studied by Collins et al. (1987), OSHA's risk assessment suggests that only one or two exposure-related excess cancer deaths would be expected among the 2,293 exposed employees; clearly, such a small excess cancer death rate, which represents an increase of only 3 percent over background rates for all neoplasms, would not have been detected by this study. OSHA finds that the results presented by Collins et al. (1987) are not inconsistent with the results of OSHA's quantitative risk assessment. OSHA therefore reaffirms in this final rule that it is appropriate to treat acrylamide as a potential occupational carcinogen.

In response to American Cyanamid's final point, which relates to the technological and economic feasibility of achieving the final rule's 0.03 mg/m^3 8-hour TWA level, OSHA notes the following. First, with very few exceptions, the Agency's final Regulatory Impact Assessment (Section VII) has determined that the controls necessary to achieve compliance with the limits proposed in this rulemaking are both technologically and economically feasible. This is clearly the case for firms, such as American Cyanamid, in the Chemical Manufacturing sector, SIC 28. Second, the EPA (1986b) study submitted by American Cyanamid (Ex. 94), entitled Assessment of Airborne Exposure and Dermal Contact to Acrylamide During Chemical Grouting Operations, showed that most worker exposures were consistently below the 0.03 mg/m^3 level at the present time. Third, a NIOSH study (Hills and Greife 1986, as cited in Ex. 94) of facilities engaged in acrylamide monomer manufacturing reported considerable variability in exposure levels between the four plants surveyed; the observed variability was due in part to differences in housekeeping practices, age and maintenance of equipment, and use of engineering controls and natural dilution ventilation. NIOSH recommended that both frequent washing of the production area and ventilation be used to reduce airborne exposures to acrylamide. OSHA believes that it is technologically feasible for affected facilities to achieve compliance with the level promulgated by this final rule (see the Technological Feasibility section of this preamble). The Agency is therefore setting a revised 8-hour TWA exposure limit of 0.03 mg/m^3 for acrylamide, with a skin notation, based on the significant risk of cancer posed to workers exposed to this substance in the workplace. OSHA concludes that this effect represents a material impairment of health and functional capacity, and the Agency concludes that the 0.03 mg/m^3 PEL will substantially reduce this significant occupational risk

OPPT Chemical Fact Sheet EPA 749-F-94-005

CHEMICALS IN THE ENVIRONMENT: ACRYLAMIDE (CAS NO. 79-06-1)

prepared by
OFFICE OF POLLUTION PREVENTION AND TOXICS
U.S. ENVIRONMENTAL PROTECTION AGENCY
September 1994

Chemicals can be released to the environment as a result of their manufacture, processing, and use. EPA has developed information summaries on selected chemicals to describe how you might be exposed to these chemicals, how exposure to them might affect you and the environment, what happens to them in the environment, who regulates them, and whom to contact for additional information. EPA is committed to reducing environmental releases of chemicals through source reduction and other practices that reduce creation of pollutants.

WHAT IS ACRYLAMIDE, HOW IS IT USED, AND HOW MIGHT I BE EXPOSED?

Acrylamide is an odorless solid that exists as flake-like crystals. It does not occur naturally but is produced in large amounts (100 million pounds in 1992) by three companies in the United States. US demand for acrylamide is likely to increase during the next several years. The largest users of acrylamide are companies that make polyacrylamide polymers. Companies also use acrylamide to make N-butoxyacrylamide and N-methylolacrylamide. Products such as clarifying agents, adhesives, printing ink emulsion stabilizers, thickening agents for agricultural sprays, and water retention aids can also contain acrylamide.

Exposure to acrylamide can occur in the workplace or in the environment following releases to air, water, land, or groundwater. Acrylamide enters the body when breathed in with contaminated air or when consumed with contaminated food or water. It can also be absorbed through skin contact. It is not likely to remain in the body due to its removal in urine.

WHAT HAPPENS TO ACRYLAMIDE IN THE ENVIRONMENT?

Acrylamide dissolves when mixed with water. Most direct releases of acrylamide to the environment are to underground sites or to air. Once in air, acrylamide breaks down to other chemicals. Microorganisms that live in water and in soil can also break down acrylamide. Because of its ability to mix with water and its inability to bind well to soil, acrylamide that makes its way into the ground can move through the ground and enter groundwater. Plants and animals are not likely to store acrylamide.

HOW DOES ACRYLAMIDE AFFECT HUMAN HEALTH AND THE ENVIRONMENT?

Effects of acrylamide on human health and the environment depend on how much acrylamide is present and the length and frequency of exposure. Effects also depend on the health of a person or the condition of the environment when exposure occurs.

Exposure to acrylamide for short periods of time can adversely affect the human nervous system. Effects range from drowsiness to incoordination, hallucinations, and confusion. Direct contact with dissolved acrylamide irritates the skin. Acrylamide dust irritates the respiratory system. These effects are not likely to occur at levels of acrylamide that are normally found in the environment.

Human health effects associated with breathing or otherwise consuming small amounts of acrylamide over long periods of time are not known. Workers repeatedly exposed to acrylamide have developed neurologic symptoms such as abnormal sensation, muscle weakness, and incoordination. Laboratory studies show that repeat exposure to acrylamide causes similar

adverse nervous system effects in animals. Studies show that repeat exposure to acrylamide also causes general toxicity, adverse blood effects, and adverse reproductive effects in animals. Lifetime exposure to small amounts of acrylamide in drinking water causes cancer in animals. Repeat exposure to acrylamide may likewise cause cancer in humans.

Acrylamide is not likely to cause environmental harm at levels normally found in the environment.

WHAT EPA PROGRAM OFFICES REGULATE ACRYLAMIDE, AND UNDER WHAT LAWS IS IT REGULATED?

EPA OFFICE	LAW	PHONE NUMBER
Pollution Prevention & Toxics	Toxic Substances Control Act	(202) 554-1404
	Emergency Planning and Community Right-to-Know Act (EPCRA) Regulations (Sec. 313)	(800) 535-0202
	Toxics Release Inventory data	(202) 260-1531
Air	Clean Air Act	(919) 541-0888
Solid Waste & Emergency Response	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)/ Resource Conservation and Recovery Act / EPCRA (Sec. 302/304/311/312)	(800) 535-0202
Water	Safe Drinking Water Act	(800) 426-4791

A technical support document can be requested from the TSCA Assistance Information Service, (202) 554-1404.

WHAT OTHER FEDERAL AGENCIES OR GROUPS CAN I CONTACT FOR INFORMATION ON ACRYLAMIDE?

AGENCY/GROUP	PHONE NUMBER
American Conference of Governmental Industrial Hygienists	(513) 742-2020
Consumer Product Safety Commission	(301) 504-0994
Food and Drug Administration	(301) 443-3170
National Institute for Occupational Safety and Health (NIOSH)	(800) 356-4674
Occupational Safety and Health Administration (Check your local phone book under U.S. Department of Labor)	

NIOSH Pocket Guide to Chemical Hazards

Acrylamide	**CAS** 79-06-1
CH_2=CHCONH$_2$	**RTECS** AS3325000
Synonyms & Trade Names Acrylamide monomer, Acrylic amide, Propenamide, 2-Propenamide	**DOT ID & Guide** 2074 153P

Exposure Limits	NIOSH REL: Ca TWA 0.03 mg/m^3 [skin] See Appendix A
	OSHA PEL†: TWA 0.3 mg/m^3 [skin]
IDLH Ca [60 mg/m^3] See: 79061	**Conversion**

Physical Description
White crystalline, odorless solid.

MW: 71.1	BP: 347-572°F (Decomposes)	MLT: 184°F	Sol(86°F): 216%
VP: 0.007 mmHg	IP: 9.50 eV		Sp.Gr: 1.12
Fl.P: 280°F	UEL: ?	LEL: ?	

Combustible Solid (may also be dissolved in flammable liquids).

Incompatibilities & Reactivities
Strong oxidizers [Note: May polymerize violently upon melting.]

Measurement Methods
OSHA 21, PV2004
See: NMAM or OSHA Methods

Personal Protection & Sanitation	**First Aid** (See procedures)
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench	Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

READ FIRST

Respirator Recommendations NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin; ataxia, numb limbs, paresthesia; muscle weakness; absent deep tendon reflex; hand sweating; lassitude (weakness, exhaustion), drowsiness; reproductive effects; [potential occupational carcinogen]

Target Organs Eyes, skin, central nervous system, peripheral nervous system, reproductive system

Cancer Site [in animals: tumors of the lungs, testes, thyroid & adrenal glands]

See also: INTRODUCTION See ICSC CARD: 0091 See MEDICAL TESTS: 0007

EPA 749-F-94-005a

CHEMICAL SUMMARY FOR ACRYLAMIDE

prepared by
OFFICE OF POLLUTION PREVENTION AND TOXICS
U.S. ENVIRONMENTAL PROTECTION AGENCY
September 1994

This summary is based on information retrieved from a systematic search limited to secondary sources (see Appendix A). These sources include online databases, unpublished EPA information, government publications, review documents, and standard reference materials. No attempt has been made to verify information in these databases and secondary sources.

I. CHEMICAL IDENTITY AND PHYSICAL/CHEMICAL PROPERTIES

The chemical identity and physical/chemical properties of acrylamide are summarized in Table 1.

TABLE 1. CHEMICAL IDENTITY AND CHEMICAL/PHYSICAL PROPERTIES OF ACRYLAMIDE

Characteristic/Property	Data	Reference
CAS No.	79-06-1	
Common Synonyms	2-propenamide	Budavari et al. 1989
Molecular Formula	C3H5NO	
Chemical Structure	CH2=CH-C-NH2 || O	
Physical State	flake-like crystals	Budavari et al. 1989
Molecular Weight	71.08	Budavari et al. 1989
Melting Point	84.5øC	Budavari et al. 1989
Boiling Point	125øC	Budavari et al. 1989
Water Solubility	2155 g/L at 30øC	Budavari et al. 1989
Density	d30/4, 1.122	Budavari et al. 1989
Vapor Density (air = 1)	2.46	Verschueren 1983
KOC	no significant adsorption	HSDB 1994
Log KOW	-0.67 (estimated)	HSDB 1994
Vapor Pressure	7 x 10-3 torr at 20øC	ACGIH 1991
Reactivity	Polymerizes violently when heated	Keith and Walters 1985
Flash Point	138øC	Keith and Walters 1985
Henry's Law Constant	302 x 10-10 atm-m3/mol	HSDB 1994
Fish Bioconcentration Factor	<2 (measured)	HSDB 1994
Odor Threshold	odorless	Keith and Walters 1985
Conversion Factors	1 ppm = 2.95 mg/m3 1 mg/m3 = 0.34 ppm	Verschueren 1983

II. PRODUCTION, USE, AND TRENDS

A. Production

There are three acrylamide producers in the United States. Table 2 lists producers, plant locations, and plant capacities. Annual capacity is approximately 171 million pounds. In 1992, approximately 100 million pounds of acrylamide were produced in the United States. During that same year, 15 million pounds were imported into the United States, and exports were estimated to be less than 2 million pounds (Mannsville 1993).

B. Use

Acrylamide is used in a number of industrial applications. The primary use of acrylamide, accounting for about 90 percent of all use, is in the production of polyacrylamide polymers. Polyacrylamide polymers have been used as additives in the coagulation process of water treatment. Because the polyacrylamide was often contaminated with residual acrylamide monomer, EPA now (effective July 30, 1994) requires a treatment technique for acrylamide (see section VI, Table 4). The treatment technique is designed to limit levels of acrylamide in products used in the water treatment, storage, and distribution process.

Acrylamide is also used as a chemical intermediate in the production of N-methylol acrylamide and N-butoxyacrylamide and as a superabsorbent in disposable diapers, medical products, and agricultural products. Small amounts of acrylamide are also used in sugar beet juice clarification, adhesives, binders for seed coatings and foundry sand, printing ink emulsion stabilizers, thickening agents for agricultural sprays, latex dispersions, textile printing paste, and water retention aids (Mannsville 1993). Table 3 shows the estimated 1993 US end-use pattern for acrylamide.

C. Trends

Demand for acrylamide is expected to increase moderately during the next few years (Mannsville 1993).

TABLE 2. United States Producers of Acrylamide

Company	Plant Location	Plant Capacity (in millions of pounds)
Cytec	Fortier, LA	70
Dow Chemical	Midland, MI	66
Nalco	Garyville, LA	35

Source: Mannsville 1993.

TABLE 3. Estimated 1993 United States End-Use Pattern of Acrylamide

Use of Acrylamide [typical Standard Industrial Classification (SIC) Code] (see end note 1)	Percentage of US Acrylamide Use
Polyacrylamide polymers (production, SIC 2821)	90%
Chemical intermediate (production, SIC 2869)	9%
Miscellaneous (no applicable SIC Code(s))	1%

Source: Mannsville 1993.

III. ENVIRONMENTAL FATE

A. Environmental Release

In 1992, environmental releases of acrylamide, as reported to the Toxic Chemical Release Inventory by certain US industries, included 28 thousand pounds to the atmosphere, 10 thousand pounds to surface water, 4.2 million pounds to underground injection sites, and 963 pounds to land (TRI92 1994). Concentrations of

0.3 ppb to 5 ppm acrylamide have been measured in various rivers near industries that use acrylamide and/or polyacrylamides (HSDB 1994). Cases of human poisoning have been documented from well water contaminated with acrylamide (no amounts given) from sewer grouting (HSDB 1994). Atmospheric levels around six US plants averaged >0.2 microgram/m3 (0.007 ppb) in either vapor or particulate form (HSDB 1994).

B. Transport

Most of the acrylamide released to the environment is expected to end up in water. Because of its low vapor pressure (7x10-3 torr), the chemical is not likely to volatilize into the atmosphere (HSDB 1994). Should the chemical reach the atmosphere, it most likely exists adsorbed to particulate matter. Its physical and chemical properties indicate that very little of the chemical will exist in the vapor phase. Acrylamide can be removed from the atmosphere in rain water (HSDB 1994). Acrylamide leaches readily into ground water from soils as predicted by its high water solubility (HSDB 1994).

C. Transformation/Persistence

1. Air - In the atmosphere, acrylamide reacts with photochemically produced hydroxyl radicals; the estimated half-life is 6.6 hours (HSDB 1994).

2. Soil - Biodegradation is the major route of removal of acrylamide from soils (U.S. EPA 1985). In aerobic soils, the chemical is 74-94% degraded in 14 days while in waterlogged, anaerobic soil 64-89% is degraded in 14 days (U.S. EPA 1985). Depending on the soil type, estimated half-lives range from 21 to 36 hours (U.S. EPA 1985).

3. Water - Biodegradation is also the major route of removal of acrylamide from water. Several microorganisms capable of utilizing acrylamide as a sole carbon and nitrogen source have been isolated, including Arthrobacter sp., Norcardia rhodochrous, Bacillus spaericus, Pseudomonas putrefaciens, and Rhodococcus sp. (U.S. EPA 1985). Acclimation of microorganisms greatly increases the rate of biodegradation (HSDB 1994; U.S. EPA 1985). Complete degradation of 10-20 ppm acrylamide in river water occurred in about 12 days with nonacclimated microorganisms; when the microorganisms were acclimated, degradation was complete in 2 days (U.S. EPA 1985).

4. Biota - Fish bioconcentration factors (BCF) for the carcass and viscera of fingerling trout are 0.86 and 1.12, respectively, indicating that no appreciable bioaccumulation of acrylamide is expected (HSDB 1994).

IV. HUMAN HEALTH EFFECTS

A. Pharmacokinetics

1. Absorption - Toxic effects of acrylamide have been observed after dermal and oral exposure, indicating absorption by these routes (U.S. EPA 1985). The chemical can also be absorbed through mucous membranes and the lung (HSDB 1994).

2. Distribution - After i.v. administration of radioactive acrylamide to rats, the chemical was found in muscle, skin, fat, blood, testes, liver, kidney, small intestine, lung, brain, spinal chord, and sciatic nerve (U.S. EPA 1985). In mice, the distal half of the sciatic nerve has been shown to accumulate 2.4 times as much acrylamide as the proximal half (U.S. EPA 1985). Acrylamide crossed the placenta with uniform fetal distribution following i.v. administration to rats, rabbits, beagle dogs, and miniature pigs "late in gestation"

(U.S. EPA 1985).

3. Metabolism - The major route of acrylamide metabolism is conjugation to glutathione to produce N-acetyl-S-(3-amino-3-oxypropyl)cysteine (U.S. EPA 1985). Conjugation is catalyzed both enzymatically and nonenzymatically in liver, brain, and skin (IARC 1985). Mercapturic acid and cysteine-S-propionamide have been identified in the urine of rats after oral administration (U.S. EPA 1985).

4. Excretion - The majority of a dose of acrylamide is excreted in the urine as the glutathione conjugate. After a single i.v. dose to a rat, 60% was excreted in the urine within 3 days (U.S. EPA 1985). Glutathione-conjugated acrylamide is also excreted in the bile. Of an administered oral dose, 71% was detected in urine and 6% in feces within 7 days; 15% of the dose appeared in the bile within 6 hours indicating that enterohepatic circulation occurs (U.S. EPA 1985).

B. Acute Toxicity

Acrylamide is a skin and respiratory tract irritant. Reported oral LD50 values in rats range from 159 mg/kg to 300 mg/kg.

1. Humans - Acrylamide is irritating to the skin and respiratory tract (IARC 1985).

2. Animals - Oral 24-hour LD50 values of acrylamide for rats range from 203 to 300 mg/kg; oral 168-hour LD50 values range from 159 to 191 mg/kg (U.S. EPA 1985). A 10% aqueous solution applied to intact rabbit skin did not cause irritation but when applied to abraded skin produced slight reddening and edema (ACGIH 1991). In the eyes of a rabbit, a 10% solution caused pain and slight conjunctival irritation that completely healed after 24 hours (ACGIH 1991).

C. Subchronic/Chronic Toxicity

Adverse effects in animals administered small amounts of acrylamide include general systemic toxicity and changes in hematological parameters.

1. Humans - Acrylamide is a human neurotoxicant (effects are described in section IV.G).

2. Animals - Male and female rats were given 0.05, 0.2, 1, 5, or 20 mg/kg/day in drinking water for 92-93 days (U.S. EPA 1985). Gross alterations occurring at the highest dose included perineal soiling, depletion of adipose tissue, decreased liver size, darkened kidneys, mottled lungs, atrophy of skeletal muscle, distention of urinary bladder, and thickening of the stomach; decreases in packed cell volume, total erythrocyte counts and hemoglobin concentrations occurred in both sexes at 20 mg/kg/day and in females at 5 mg/kg/day.

Decreased body weight in male rats given 2 mg/kg/day in drinking water (section IV.D) for 738-746 days was the only noncarcinogenic effect observed (U.S. EPA 1985). Acrylamide is a carcinogen and a neurotoxicant to animals. These effects are described in sections IV. D and IV. G, respectively.

D. Carcinogenicity

Although inadequate evidence is available from human studies, several laboratory animal studies have shown that acrylamide causes a variety of tumors in rats and mice. Acrylamide has been classified by the U.S. EPA as a B2, a probable human carcinogen, and by IARC as a 2B, a possible human carcinogen.

1. Humans - Two epidemiologic studies of occupational exposures to acrylamide were inadequate to evaluate the carcinogenic potential of the chemical to humans (U.S. EPA 1994). Limitations included lack of exposure data, inadequate study size, multiple chemical exposures, and incomplete ascertainment of cause of death.

2. Animals - Male and female rats were given 0.01, 0.1, 0.5, or 2.0 mg/kg/day acrylamide in drinking water for 2 years (U.S. EPA 1994). At the two highest doses, a statistically significantly increased incidence of tumors was seen in the scrotum, adrenal, thyroid, CNS, mammary, oral cavity, and uterus. Acrylamide has been shown to cause lung and skin tumors in mice when administered by gavage, dermally, or intraperitoneally (U.S. EPA 1994; ACGIH 1991). Male and female mice given 6.25, 12.5, or 25 mg/kg, 3 times/week, for 8 weeks by gavage had a dose-responsive increase in lung adenomas (IARC 1985). Based on sufficient evidence of carcinogenicity in animals, acrylamide has been classified by the U.S. EPA as B2, probable carcinogen in humans (U.S. EPA 1994). The oral slope factor (see end note 2) for acrylamide is 4.5 per (mg/kg)/day (U.S. EPA 1994). The drinking water unit risk for acrylamide is 1.3 x 10-4 per (microgram/L) (see end note 3) (U.S. EPA 1994). Acrylamide has been classified by IARC (1987) as 2B, possibly carcinogenic to humans, based on inadequate data in humans but sufficient evidence in animals.

E. Genotoxicity

Acrylamide causes chromosomal aberrations, dominant lethality, sister chromatid exchanges and unscheduled DNA synthesis in various in vitro and in vivo systems (U.S. EPA 1994). When administered at a level of 500 ppm in the diet for 3 weeks in mice acrylamide caused a high frequency of sister chromatid exchanges and breaks (U.S. EPA 1985).

F. Developmental/Reproductive Toxicity

No information was found on the developmental/reproductive effects of acrylamide in humans. Acrylamide does not appear to cause structural developmental defects by oral administration to rats. Testicular atrophy and decreased fertility have been reported in male mice given acrylamide by mouth.

1. Humans - No information was found in the secondary sources searched regarding the developmental or reproductive toxicity of acrylamide to humans.

2. Animals - Pregnant rats received 20 mg/kg/day acrylamide by gavage on days 7-17 of gestation (U.S. EPA 1985). One day after birth, pups exposed in utero and unexposed pups were divided and foster-nursed to either treated or untreated dams. At 2 weeks of age, binding of dopamine receptors by radioligand was significantly reduced in male pups exposed to acrylamide in utero regardless of whether they nursed on treated or control dams; reduced dopamine receptor binding occurred in female pups that nursed on treated dams regardless of in utero exposure. These differences of receptor binding were resolved by 3 weeks of age (U.S. EPA 1985).

   Female rats were treated with 25 or 50 ppm in the diet 2 weeks prior to mating and continued through day 19 of gestation (U.S. EPA 1985). At birth there were no differences in litter size, fetal weight, viability, or gross malformations. At weaning, histopathology showed some degeneration of the sciatic and optic nerves of the treated pups. Normal growth and development occurred in pups from dams given 200 ppm acrylamide in feed from mating to parturition (ACGIH 1991). Slight decreases in fetal weights coincided with maternal toxicity in

rats fed 400 ppm for 20 days after mating (ACGIH 1991).

Injection of fertilized chicken eggs with 0.03-0.6 mg acrylamide on day 5, 6, or 7 of incubation increased mortality and leg deformities among surviving chicks (IARC 1985). Injection of 0.007, 0.07, or 0.7 mg on day 3 resulted in increased death but no malformations.

Male mice treated with 0.5 mmol/kg (0.035 g/kg) by gavage 2 times/week, for 8 weeks had testicular atrophy, reduced numbers of spermatozoa, degenerating spermatids and spermatocytes, and multinucleate giant cells (U.S. EPA 1985). A single i.p. injection to mice of 50, 100, or 150 mg/kg caused decreased mitosis in spermatogonia within 24 hours. Testicular degeneration was also seen in male rats given 400 ppm in the diet for 90 days (ACGIH 1991). Testicular and uterine atrophy were observed in male and female rats exposed to 20 mg/kg/day in drinking water for 92-93 days (U.S. EPA 1985).

Male rats receiving 0.5, 2, or 5 mg/kg/day for 10 weeks were mated to unexposed females (HSDB 1994). Females mated to high dose males had differences (not defined) in total number of implants/litter, number of viable implants/litter, pre- and post implantation losses, and number of resorptions when compared to females mated to control males. Male and female rats were given 0.5, 2, or 5 mg/kg/day acrylamide in drinking water for 10 weeks prior to mating, and females continued exposure during gestation and lactation (HSDB 1994). The fertilityindex and number of actual pregnancies decreased in the high dose group as compared to unexposed controls.

G. Neurotoxicity

Acrylamide is a neurotoxin by either oral (in animals) or inhalation exposure (in humans and in animals). Toxic effects are central and peripheral neuropathy causing drowsiness, hallucinations, distal numbness, and ataxia. Recovery is possible after cessation of exposure. EPA has derived an oral reference dose (RfD)(see end note 4) of 0.0002 mg/kg/day for acrylamide, based on adverse nervous system effects in laboratory animals.

1. Humans - Studies of the effects of acrylamide in humans indicate that neurotoxicity, including paresthesias in the fingers, coldness, numbness in lower limbs, and weakness of the hands and feet; no additional detail is provided (U.S. EPA 1985). Acrylamide is a neurotoxin with an affinity for the peripheral ends of the spinal nerves in the extremities (IARC 1985). Exposures in humans have been associated with polyneuropathy with motor and sensory impairment marked by numbness, paresthesias, ataxia, tremor, dysarthria, and mid-brain lesions (HSDB 1994). Ingestion of contaminated drinking water has caused drowsiness, disturbances of balance, confusion, memory loss, and hallucinations (HSDB 1994). A study of factory workers exposed to 0.07 to 2.5 times the NIOSH recommended exposure limit (0.03 mg/m3) showed a dose response relationship for abnormal sensation, decreased motor strength, abnormal gait or rombergism, and skin abnormalities (HSDB 1994). The concentration of 0.03 mg/m3 is rouoghly equivalent to 0.004 mg/kg/day for an 8-hour work day (see end note 5). Among workers exceeding the limit, 67% had symptoms of acrylamide intoxication compared with 14% of workers below theexposure limit. Clinically, acrylamide toxicity is a dying back axonopathy with onset of neuropathy in the distal node of the longest fibers, inhibition of fast axoplasmic transport, and enzyme impairment (HSDB 1994).

2. Animals - The U.S. EPA (1994) has calculated a chronic oral reference dose for acrylamide of 0.0002 mg/kg/day, based on the following information. Axon and myelin degeneration occurred in

rats exposed to 5 or 20 mg/kg/day in drinking water for 92-93 days but was no longer apparent by 144 days post treatment. The no-observed-adverse effect level (NOAEL) for this study was 0.2 mg/kg/day (U.S. EPA 1994). Rats given 52, 80, 125, or 200 mg/L (approximately 7, 11, 18, and 28 mg/kg/day) in drinking water for 60-90 days had decreased rotarod performance at the two highest concentrations; histological evaluation of the tibial and sciatic nerves of high-dose rats revealed morphological changes and myelin degeneration (U.S. EPA 1985). Rats were treated with acrylamide at 5, 10, or 20 mg/kg/day by gavage for 13 weeks. High dose rats had decreased hind limb extensor response and spontaneous motor activity. Nerve fiber degeneration was observed in both the mid- and high-dose groups.

After a 5 week recovery period, neuropathological changes were still evident in the highdose rats (U.S. EPA 1985). Exposure of rats to 25 mg/kg by gavage for 21 days "markedly" reduced brain dopamine and noradrenaline (HSDB 1994). Severe leg weakness, accompanied by histological evidence of peripheral nerve degeneration occurred in rats treated with 200, 300, or 400 ppm acrylamide in the diet for 48 weeks (U.S. EPA 1985).

Gait disorders, observed in cats treated with 3 mg/kg/day in drinking water, progressed to distal muscle weakness and drop-foot in the hind limbs; muscle atrophy occurred subsequent to denervation (U.S. EPA 1985). Dose-related neurotoxicity was observed in cats given 1, 3, or 10 mg/kg/day in a 1-year feeding study (HSDB 1994). EEG abnormalities were seen in cats treated with acrylamide (no dose or duration given) prior to development of ataxia (HSDB 1994). Monkeys were given 3 or 10 mg/kg/day by gavage, 5 days/week for 1 year (U.S. EPA 1985). Severe muscle weakness occurred after 69 days of 10 mg/kg/day and sporadic deficits in reflex reactions were observed at 3 mg/kg/day. Visual acuity and contrast sensitivity were decreased in monkeys for 140 days after treatment (no dose given) (HSDB 1994). Dogs exposed to 7 mg/kg/day for 8 weeks developed sensorimotor peripheral neuropathy and megaesophagus due to vagal axonopathy (HSDB 1994).

V. ENVIRONMENTAL EFFECTS

Acrylamide has low acute toxicity to aquatic organisms; toxicity values are generally greater than 100 mg/L. Acrylamide is not likely to be acutely toxic to aquatic or terrestrial animals at levels found in the environment. Long-term exposure to terrestrial animals may increase tumor incidence or adversely affect reproductive abilities.

A. Toxicity to Aquatic Organisms

U.S. EPA (1985) has reported LC50 values for acrylamide for several species of fish, including Carassius auratus (goldfish), Rasbora heteromorpha (harlequin fish), and Poecilia reticulata (guppy). Flowthrough LC50 values of 460 mg/L, 250 mg/L, and 130 mg/L were reported for the harlequin fish in 24-hour, 48-hour, and 96-hour tests, respectively. The static 24-hour and 96-hour LC50 values for the goldfish are 460 mg/L and 160 mg/L, respectively.

The 7-day LC50 value for the guppy is approximately 35 mg/L. The 24-hour LC50 for Daphnia magna (water flea, first instar) is 230 mg/L (AQUIRE 1994).

B. Toxicity to Terrestrial Organisms

No information was found in the secondary sources searched regarding the toxicity of acrylamide to terrestrial organisms. Based on the range of oral LD50's of acrylamide for rats, 159 to 300 mg/kg, the chemical is not expected to be acutely toxic to terrestrial animals at levels normally found in the environment. However, long-term exposure from residues in water, may increase tumor incidence

and decrease fertility in males based on chronic drinking water studies in rats.

C. Abiotic Effects

No information was found on the abiotic effects of acrylamide in the secondary sources searched.

VI. EPA/OTHER FEDERAL ACTIVITY

The Clean Air Act Amendments of 1990 list acrylamide as a hazardous air pollutant. Occupational exposure to acrylamide is regulated by the Occupational Safety and Health Administration (OSHA). The permissible exposure limit (PEL) is 0.3 milligrams per cubic meter of air (mg/m3) as an 8-hour time-weighted average (TWA). OSHA has added a skin notation to its PEL for acrylamide, indicating that workplace dermal exposure should be controlled as well (29 CFR 1910.1000).

Federal agencies and other groups that can provide additional information on acrylamide are listed in Tables 4 and 5.

TABLE 4. EPA OFFICES AND CONTACT NUMBERS FOR INFORMATION ON ACRYLAMIDE.

EPA OFFICE	LAW	PHONE NUMBER
Pollution Prevention & Toxics	Toxic Substances Control Act (Sec. 8A/8D/8E)	(202) 554-1404
	Emergency Planning and Community Right-to-Know Act (EPCRA) Regulations (Sec. 313)	(800) 535-0202
	Toxics Release Inventory data	(202) 260-1531
Air	Clean Air Act	(919) 541-0888
Solid Waste & Emergency Response	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)/ Resource Conservation and Recovery Act / EPCRA (Sec. 302/304/311/312)	(800) 535-0202
Water	Safe Drinking Water Act (treatment technique requirement; see end note 6)	(800) 426-4791

TABLE 5. OTHER FEDERAL OFFICES/OTHER GROUP CONTACT NUMBERS FOR INFORMATION ON ACRYLAMIDE.

Other Agency/Department/Group	Contact Number
American Conference of Governmental Industrial Hygienists (Recommended Exposure Limit (see end note 7): 0.03 mg/m3; [skin] (see end note 8)	(513) 742-2020
Consumer Product Safety Commission	(301) 817-0994
Food & Drug Administration	(301) 443-3170
National Institute for Occupational Safety & Health (Recommended Exposure Limit (see end note 7): 0.03 mg/m3; [skin] (see end note 8) (NIOSH 1990)	(800) 356-4674
Occupational Safety & Health Administration Permissible TWA (see end note 9), 0.3 mg/m3; [skin] (see end note 8) (OSHA 1993)	Check local phone book for phone number under Department of Labor

VII. END NOTES

1. Standard Industrial Classification code is the statistical classification standard for all Federal economic statistics. The code provides a convenient way to reference economic data on industries of interest to the researcher. SIC codes presented here are not intended to be an exhaustive listing; rather, the codes listed should provide an indication of where a chemical may be most likely to be found in commerce.

2. The slope factor is a plausible upper-bound estimate of the probability of a response per unit intake of a chemical over a lifetime. The slope factor is used in risk assessments to estimate an upper-bound lifetime probability of an individual developing cancer as a result of exposure to a particular level of a potential carcinogen.

3. The unit risk is a quantitiative estimate in terms of risk per unit intake of a chemical. The unit risk for acrylamide incorporates information on pharmacokinetics and metabolism.

4. The RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of the daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during the time period of concern.

5. Calculated by multiplying 0.03 mg/m3 by 0.143 (the standard 8-hour occupational breathing rate, 10 m3, divided by the assumed adult body weight, 70 kg, and assuming 100% absorption) to obtain the dose in mg/kg/day (U.S. EPA 1988).

6. As defined in 40 CFR 142.2, specifies for a contaminant a specific treatment technique(s) which leads to a reduction in the level of such contaminant sufficient to comply with the requirements of 40 CFR 141. Refer to 40 CFR 141.111 for the treatment technique for acrylamide.

7. The ACGIH/NIOSH exposure limits are time-weighted average (TWA) concentrations for an 8-hour workday (ACGIH) and up to a 10-hour workday (NIOSH) for a 40-hour workweek.

8. A [skin] notation indicates that air sampling is not sufficient to accurately quantitate exposure. Measures to prevent significant cutaneous absorption may be required.

9. PEL-TWA, permissible exposure limit time-weighted average.

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Neutron Products- Results of Soils and Waters from 8/02

Location	pCi/g of Co-60
Fence Inside LAA	297 +- 17
Outside LAA fence line	14.6 +- .83
Under air conditioner	18.6 +- 1.1
Stainless pipe outside LAA	20.9 +- 1.2
Roof Drain W of LAA	14.5 +- .82
Roof Drain W of LAA	14.6 +- .83
Soil under power panel	8.47 +- .48
Stone gravel trap inlet	26.9 +- 1.5
Power pole near dry pond	71.6 +- 4.1
Dry pond west edge of channel underneath liner	368 +- 21
Dry pond hot particle	35.3 +- 2
RR old siding	11.6 +- .66
8 ft from back fence	ND
1 meter west of NP #12	41 +- 2.3
South power pole- west property line	53.9 +- 3.1
Fence line SW corner	33.7 +- 1.9
Fence line SW corner	34.9 +- 2
5 ft W of fence	11.7 +- .67
RR siding 2 ½ posts E of SW corner	116 +- 6.6
5 Ft E of stop sign	16.9 +- .96
White house lawn	32.7 +- 1.9
Dickerson Conservation Park	ND
Fire Station Bealsville	ND
Culvert Outfall	.15 +- .012
Culvert outfall	.16 +- .015
Culvert inlet	6.6 +- .38
Monocacy Creek sediment	ND
Little Monocacy Creek (water)	ND
Little Monocacy Creek (water)	ND

MARYLAND DEPARTMENT OF THE ENVIRONMENT
AIR AND RADIATION MANAGEMENT ADMINISTRATION
RADIOLOGICAL HEALTH PROGRAM

FACSIMILE TRANSMITTAL SHEET

TO: Sheri Minnick

ORGANIZATION: EPA

FROM: Alan Jacobson

MDE –ARMA – Radiological Health Program
2500 Broening Highway – Baltimore MD 21224
(Phone) 410- 631-3300 410-631-3198 (fax)
or 1-800 633-6101 (in Maryland only)

Date: 7 / 11 /2002

# of pages (including this sheet): _____

COMMENTS:

Has Ne State checked the pool?

Water radioactive.

Additional monitoring better than TLD.

was not controlled.

10. Perimeter Monitoring Program:

The licensee monitors the boundary of the facility using Eberline TLDs which are processed quarterly and placed approximately 100 feet apart. Records were reviewed for the calendar year of 1996. Results indicated compliance with the 500 millirem per year regulatory limit. Results of TLDs placed by the RHP at selected sites at the boundary of the plant also indicates compliance. On April 30, 1997, I noticed that NPI did not have monitors posted on a 450 foot section of the perimeter near the road, dry pond and railroad tracks. I searched the area but the missing monitors could not be found. I also discovered that five TLDs posted by the RHP were also missing. I suspect that these monitors were removed intentionally by unknown persons.

Issue of Concern:
Radiation monitoring devices belonging to NPI and the RHP were removed from designated sites at the boundary of the facility by an unknown person. As a result, radiation levels at this boundary were not continuously monitored to establish compliance with regulatory limits described in Amendment-33 Item L.

11. One Kilometer Surveys:

Issue of Concern: as required to
NPI personnel conduct monthly surveys of properties located within a one kilometer radius of the plant. Records were reviewed from January 1996 to March 1997. On February 18 and 22, 1997, NPI personnel conducted a survey of a private property located almost one kilometer from the plant and identified two contaminated spot containing 0.5 and 0.7 microcuries of cobalt-60. The inspection team's review of NPI's one kilometer surveys indicated a significant decrease in surveys of private residential properties. Only three private homesites were surveyed by NPI since January 1996. Furthermore, NPI has still not surveyed the majority of the homesites located within the one kilometer radius.

12. Cobalt-60 in Soil

Item of Noncompliance:
The radiation dose rate at one meter above the ground surfaces of the dry pond and the adjacent railroad property exceeds the dose rate limit of 10.0 microR/hr above background. The adjacent property owner has still not been notified. Furthermore, the laboratory analysis of the soil sample collected from the dry pond and the adjacent property on June 28, 1996, December 12, 1996 and April 30, 1997 exceeded the 8.0 picocuries per gram concentration limit for cobalt-60 contamination. This issue has been determined to be an ongoing violation that still remains unresolved.

Issue of Concern:
Cobalt-60 continues to be found outside of NPI's boundary thus substantiating the loss

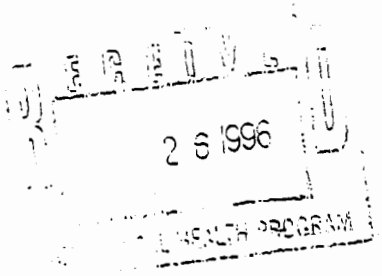
any license or registration condition.

Contrary to the above paragraphs, on May 21, 2000 NPI shipped a 4080 Curie cobalt-60 sealed source to All Care Animal Referral Center (All Care) located in Fountain Valley, California. Prior to shipment, NPI failed to verify that All Care was authorized to receive that type, form and quantity of material. The State of California's Radiological Health Branch reported that All Care had not fulfilled their responsibilities of their license in obtaining approval for the source exchange. In addition, their license had not been amended to accommodate the delivery of the new source. Notwithstanding these circumstances, NPI dispatched a truck carrying this source cross country intending to deliver the source to All Care. Mr. Marvin Turkanis, NPI's Vice President and Radiation Safety Officer of the "03" license, stated that he was aware that All Care was an unauthorized recipient, "however;" he shipped the source anyway. He had hoped to obtain approval while the source was in route. On May 24, 2000, the intended delivery date, the State of California notified Mr. Ed Derosa of NPI, that since All Care was an unauthorized recipient, the delivery of the source would be in violation of State Regulations. On May 25, 2000 NPI instructed its drivers to return the source to NPI's Dickerson Facility. As a result, NPI failed to ship the radioactive material in accordance with the outgoing shipping papers. Furthermore, other irregularities were identified with the return shipping papers. In a July 12, 2000 letter, Mr. Turkanis reported that at no time was the source on the licensee's premises or even in the licensee's city. However, lines 7 and 10 of the return shipping papers indicate that the source was shipped from All Care Animal Referral Center in Fountain Valley, California a day earlier on May 27, 2000. The bottom line of the return shipping papers indicates that the truck departed All Care Animal Referral Center in Fountain Valley, California a day earlier on May 26, 2000. The package authorization line on the return shipping paper was left blank. Also, Mr. Turkanis reported that NPI shipped the source on a NPI vehicle which was going to Los Angeles for other reasons on May 21, 2000. The State of California reported that the truck was turned back while in Arizona on May 24, 2000. With numerous discrepancies of the facts of this source shipment, please provide MDE with a clear explanation of this matter and whether you are in agreement with or not by what has been stated in the last paragraph.

Specific Areas of Review:

One Kilometer Surveys – At least one of the surrounding properties is surveyed on a monthly basis. Since the last inspection in Nov 1999, only one particle was found on 7/10/2000 and located on the Burdette property. Twenty-eight gallons of contaminated soil were removed for a total activity of 1.25uCi of cobalt-60. Survey meters used to conduct these surveys are a Ludlum 177 (calibrate quarterly), a Bicron MicroRem meter (calibrated annually), and a Eberline E-600 (calibrated quarterly). Refer to the attached map of the area supplied by NPI showing the properties surveyed since the last inspection.

Property TLD Monitors –TLDs are posted and exchanged on a quarterly basis. The closest property, Mr. Fisk's house, received a total of 105.4 mRem for the badge outside his home and 66.2 mRem for the badge inside his home in the year 1999. Totals for the first two quarters of 2000



NEUTRON PRODUCTS INC
22301 Mt. Ephraim Road
P.O. Box 68
Dickerson, Maryland 20842 USA
301/349-5001 TWX: 710-828-0542
FAX: 349-2433

August 22, 1996

Mr. Alan Jacobson
Radiological Health Program
Department of the Environment
State of Maryland
2500 Broening Highway
Baltimore, Maryland 21224

Re: Radioactive Material License Number MD-31-025-01, Radioactive Material Inventory

Dear Mr. Jacobson:

Please find enclosed Neutron Products inventory records for radioactive material under the above referenced license.

The inventory for material licensed under 6.A. is summarized below:

Cobalt-60 radiation processing sources and targets stored in the main pool and canals. These records were last compiled on July 18, 1996 and accounted for 691,660 Ci as of July 1, 1996.

Cobalt-60 teletherapy sources and slugs, which include completed sources, current melts, and trade-in slugs for reuse in teletherapy sources. These records were last compiled on July 15, 1996 and accounted for 749,940 Ci as of January 1, 1996.

Cobalt-60 teletherapy sources and slugs available for remanufacture as radiation processing sources. These records were last compiled on August 19, 1996 and will account for 189,278 Ci on September 1, 1996.

Two stellite corners containing an estimated 40,000 Ci of cobalt-60 as of this date, the activity of the stellite has never been accurately measured and cannot be until it can be transferred to the hot cell.

Approximately 250 lower activity cobalt-60 radiation processing sources containing a total of approximately 20,000 Ci. We are in the process of recalibrating these sources.

Radioactive waste encapsulated in the main pool and in dry storage. These records were last compiled as of March 1, 1996 and accounted for 5,166 Ci as cobalt-60 as of December 31, 1995.

In addition we have:

220 Ci of cobalt-60 in the AECL Gammacell 220,

a total of 54 mCi of cobalt-60 in 8 calibration/check sources,

a 1 mCi of cesium 137 calibration source.

Should you have any questions, please contact me.

Very truly yours,

NEUTRON PRODUCTS, INC.

Jeffrey Williams
Radiation Safety Officer

Enclosures

MARYLAND DEPARTMENT OF THE ENVIRONMENT
AIR AND RADIATION MANAGEMENT
2400 Broening Highway
Baltimore, Maryland 21224

MEMORANDUM

TO: Neutron Products Inc, MD-31-025-01 File
Accident/Incident File

THRU: Alan Jacobson, Health Physicist Supervisor

FROM: Bob Nelson, Health Physicist III

DATE: June 28, 2002

SUBJECT: NPI Dumpster sets off Radiation Alarm

On June 27, 2002, Jeff Williams, the Radiation Safety Officer for Neutron Products, Inc. called me while I was at NPI conducting an inspection with MOSH, to report that Montgomery County's Shady Grove Trash Transfer station had their radiation detection alarm set off by a dumpster from NPI. He stated the readings were 60 uR/hr on the side of the dumpster according to the county's detector. He said he was there but he did not have a meter with him and asked how soon someone from MDE could respond. He said the county had already called MDE. I called our office and was told that Alan Jacobson was responding.

At approximately 8:45 am, Mike Sharon of TARSA relayed to Roland Fletcher of ARMA a notification he had received from the Montgomery County Department of Environmental Protection that a "roll off" refuse container from Neutron Products Incorporated, set off the radiation alarms at the Shady Grove Solid Waste Transfer Station in Rockville, Maryland. Alan Jacobson, an ARMA Health Physicist responded to the incident, conducted independent

measurements, verified that the load contained cobalt-60, interviewed personnel on site and ensured that the load could be safely transported back to Neutron. The Transfer Station rejected the load and it was transported back to Neutron for further evaluation. Bob Nelson, an ARMA Health Physicist was at Neutron assisting a Maryland Occupational Health and Safety (MOSH) Inspector who was investigating unsafe working conditions. Mr. Nelson assisted Neutron employees in locating the radioactive material in the container. A plastic bag containing paper towels and rags measuring 0.5 millirem per hour was identified, removed and placed in storage as radioactive waste at Neutrons Dickerson facility. Mr. Nelson determined that Neutron failed to comply with Maryland Regulations governing disposal of radioactive waste, performance of surveys and monitoring of items for disposal. Further Departmental as a result of this incident is being pursued. The MOSH Inspector also identified a list of occupational safety and health violations, some of which were considered serious.

Reviewed

MDE

MARYLAND DEPARTMENT OF THE ENVIRONMENT

2500 Broening Highway • Baltimore, Maryland 21224
(410) 631-3000 • 1-800-633-6101 • http://www.mde.state.md.us

Parris N. Glendening
Governor

Jane T. Nishida
Secretary

April 23, 2002

Abraham Ferdas, Director
Hazardous Sites Cleanup Division
United States Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia PA 19103-2029

Dear Mr. Ferdas:

The Maryland Department of the Environment ("MDE" or "the Department") has regulatory responsibility for the issuance of radioactive material licenses. Until recently, the Neutron Products, Inc. (NPI) facility in Dickerson, Maryland manufactured specialized radiation sources utilizing Cobalt 60. The facility has operated since the 1960s.

In 1998, a new State rule became effective which required facility operators, such as NPI, to provide financial assurance for the future decommissioning of licensed radiological sites upon site closeout. NPI has failed to fund the facility's decommissioning obligation. Consequently, MDE pursued enforcement action against NPI and obtained a permanent injunction prohibiting operation of its manufacturing (01) license. The appeal process for the injunction has ended with the State's highest court upholding the Department's actions. While the Department is still in litigation with NPI over the decommissioning of the facility, we are growing increasingly concerned about the continued financial viability of NPI. Neutron still operates two irradiators at the site. While there is no current enforcement effort to close these irradiators, the economic viability of their continued operation without the 01 operation is highly questionable.

Based on regular environmental monitoring by MDE in the area of the NPI facility, there does not appear to be a significant impact to off-site areas at this time. However, we are concerned about the longer-term prospects. For example, should NPI abandon its operations at the site without adequate notice and safeguards, off-site impact may increase to unacceptable levels. In addition, the long-term stability of the containment of the radioactive waste material on site is in question and will likely be subject to degradation over time. Moreover, as the financial condition of the company deteriorates, its ability to retain competent and trained personnel as well as its ability to maintain physical safeguards at the facility may be compromised.

Consequently, MDE requests that the Hazardous Sites Control Division perform an Integrated Assessment of the NPI facility. It is our understanding that such an assessment will allow the United States Environmental Protection Agency and the State to properly evaluate the best course of action to insure the continued protection of human health and the environment.

The following information is provided to facilitate the planning and execution of the requested integrated assessment of the NPI facility:

Neutron Products Incorporated
22301 Mt. Ephraim Road
P.O. Box 68
Dickerson, Maryland 20842

Facility Contact:
Jeffrey Williams, Radiation Safety Officer
Jackson Ransohoff, President
(301) 349-5001

MDE Points of Contact:
Ray Manley, Air and Radiation Management Administration
(410) 631-3191

Karl Kalbacher, Waste Management Administration
(410) 631-3437

Thank you for your consideration of our request. If you have any questions regarding the above information, please call me at (410) 631-3305 or have your staff contact Mr. Kalbacher at (410) 631-3437.

Sincerely,

Richard W. Collins, Director
Waste Management Administration

RWC:jyf

cc: Jane Nishida, Secretary, Maryland Department of the Environment
Ms. Ann Marie Debiase, Director, Air and Radiation Management Administration
Mr. Karl Kalbacher
Mr. Frank Levi
Mr. Ray Manly

MDE

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Sincerely,

Richard W. Collins, Director
Waste Management Administration

RWC:jyf

cc: Jane Nishida, Secretary, Maryland Department of the Environment
Ms. Ann Marie Debiase, Director, Air and Radiation Management Administration
Mr. Karl Kalbacher
Mr. Frank Levi
Mr. Ray Manly

Neutron Products Mtg. 3/26/02

Name	Office	Tel.	E-mail
Charles Howland	EPA Reg. III	215-814-2645	howland.charles@epa.gov
Michael Forlini	OAG/MDE	410 [illegible]-3421	mforlini@mde.state.md.us
Bill Belanger	EPA Cubicle	215-814-2082	belanger.bill@epa.gov
Sheri Minnick	EPA Reg III	215-814-2089	minnick.sheri@epa.gov
Tom STUKAS	ATSDR Reg III	215-814-3128	STUKAS.Tom@epa.gov
Jennifer Hubbard	"	215-814-3328	hubbard.jennifer@epa.gov
FRANK Levi	MDE Attorney General's office	410-631-3033	flevi@mde.state.md.us
KARL KALBACHER	MDE - Superfund	(410) 631-3437	KKALBACHER@mde.state.md.us
ANA MARIE DEBIASE	MDE/ARMA	410-631-3255	adebiase@mde.state.md
H Robert Field	AG/MDE	410-631-3833	rfield@mde.state
ROWAND G FLETCHER	MDE/ARMA/RHP	410-631-3300	rfletcher@mde.state.md.us
Kay Manley	MDE/ARMA/RHP	410 631-3300	rmanley@MDE.STATE.MD.US
Alan Jacobson	MDE/ARMA/RHP	410 631-3300	ajacobson@mde.state.md.us
MICHAEL TAURINO	EPA	2158143371	TAURINO.MICHAEL@EPA.GOV
Kevin Wood	EPA/Site Assessment	215-814-3303	wood.kevin@epa.gov
Lorie Baker	EPA/Site Assessment	215-814-3355	baker.lorie@epa.gov
DENNIS CARNEY	EPA/Acting Dep. Dir - HSCD	(215) 814-3241	CARNEY.DENNIS@EPA.GOV

SOIL SAMPLES

Multi-Channel Analyzer

DATE 2-28-02 SIGNATURE [signature]

STANDARD 185

BACKGROUND 68

RESULT 117

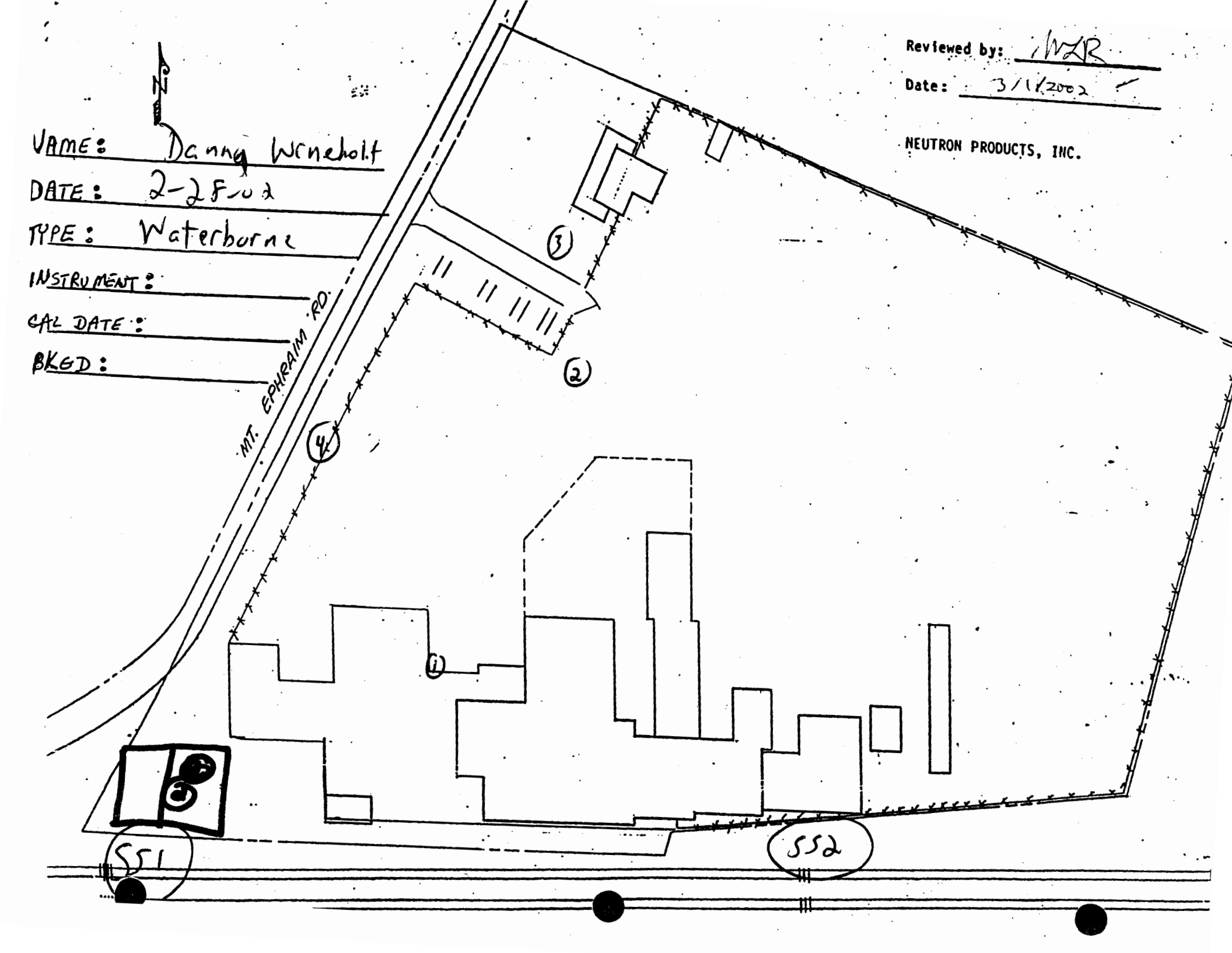
2813

2.4 pC/COUNT

SAMPLES 1-4 = 600 SECONDS 5-12=60 SECONDS	LOCATION	COUNTS	NET COUNTS TIME	500 ml Marinelli BEAKER	uC/cc SAMPLE Wet	pC/g SAMPLE Dry
1	WELL (1)	124	56	150mL	9X10-7	
2	WELL	121	53	150mL	8.5X10-7	
3	WELL	98	30	150mL	4.8X10-7	
4	WELL	76	—	150mL	~~1X10-7~~	MKR 3/1/02
5	SS1	36	29.2	134 GRAMS		~~5.2~~ 5.2
6	SS2	21	14.2	148 GRAMS		~~2.3~~ 2.3
7	DP1	98	~~98~~ 94.2	143 GRAMS		~~15.~~ 15.
8	DP2	237	230.2	115 GRAMS		~~48~~ 48
9	N1	35	28.2	123 GRAMS		~~5.5~~ 5.5
10	N2	9	2.2	141 GRAMS		~~.3~~ .3
11	N3	8	1.2	143 GRAMS		~~.20~~ .20
12	N4	10	3.2	115 GRAMS		~~.07~~ .07
13						
14						
15						

WATER

SOIL


Reviewed by: MZR
Date: 3/14/2002
NEUTRON PRODUCTS, INC.
NAME: Danny Wenchold
DATE: 2-28-02
TYPE: Waterborne
INSTRUMENT:
CAL DATE:
BKGD:
MT. EPHRAIM RD.
1
2
3
4
5
6
551
552

MARCH SAMPLES

SOIL SAMPLES

Multi-Channel Analyzer

DATE 4-202

SIGNATURE Danny Winchell

STANDARD 172

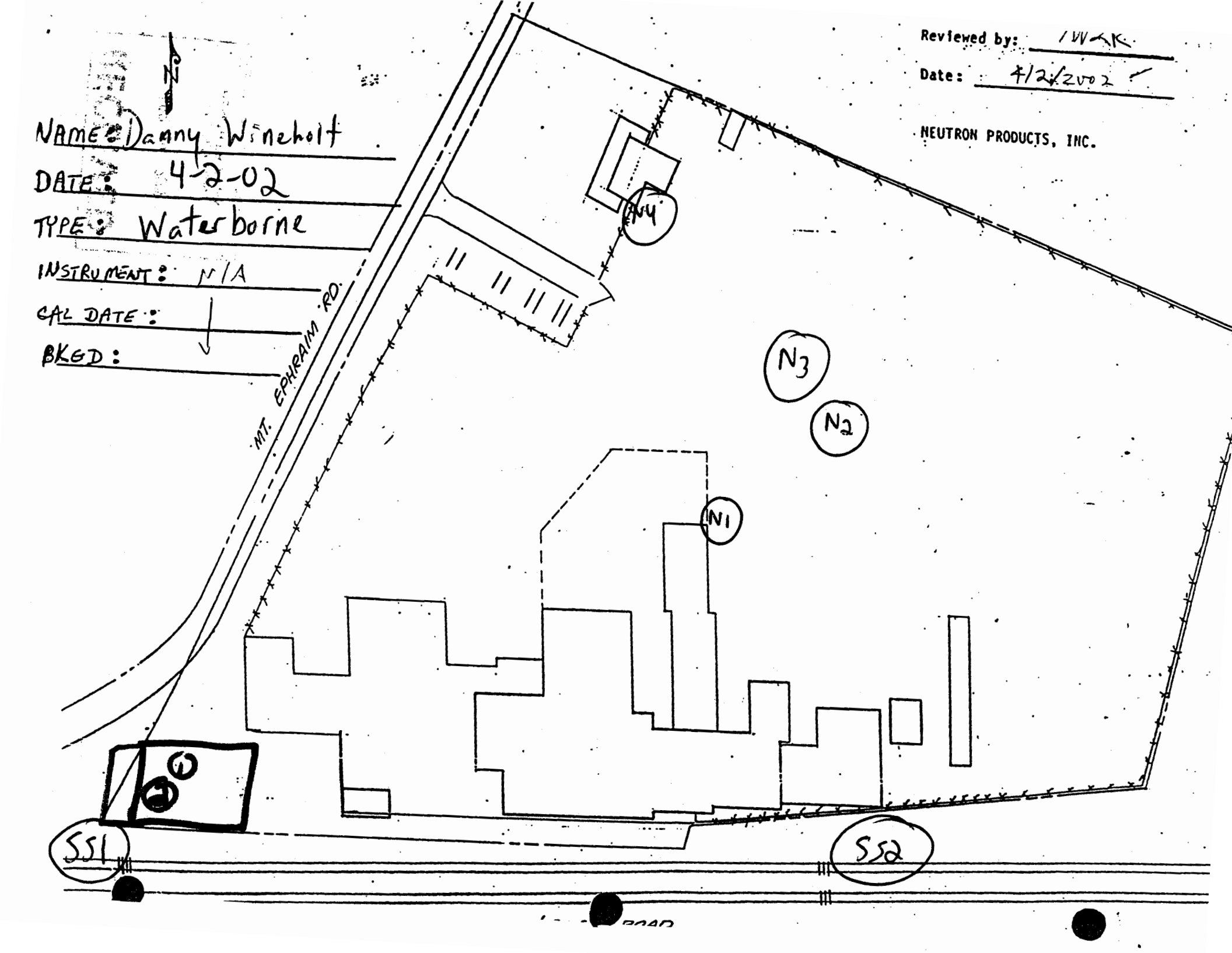
BACKGROUND 69

RESULT 103

278
103 = 2.7

WATER / SOIL

	LOCATION	COUNTS	NET (COUNTS ~~/ TIME~~)	~~500 ml~~ Marinelli BEAKER	SAMPLE (uCi/cc) ~~Wet~~	SAMPLE (pCi/g) ~~Dry~~
1	WELL 1	82	13	150mL	2.3x10⁻⁷	
2	WELL 2	83	14	150mL	2.5x10⁻⁷	
3	WELL 3	80	11	150mL	2x10⁻⁷	
4	WELL 4	73	4	150mL	1x10⁻⁷	
5	N 1	11	4.1	157		.71
6	N2	8	1.1	116		.26
7	N3	11	4.1	108		1.03
8	N4	13	6.1	160		1.03
9	DP1	65	58.1	116		13.5
10	DP2	178	171.1	152		30.4
11	551	40	33.1	202		4.4
12	552	19	12.1	163		2.0
13						
14						
15						


Reviewed by:
Date: 4/2/2002
NEUTRON PRODUCTS, INC.
NAME: Danny Winebolt
DATE: 4-2-02
TYPE: Waterborne
INSTRUMENT: N/A
CAL DATE:
BKGD:
MT. EPHRAIM RD.
N4
N3
N2
N1
SS1
SS2

MARYLAND DEPARTMENT OF THE ENVIRONMENT

2500 Broening Highway • Baltimore, Maryland 21224
(410) 631-3000 • 1-800-633-6101 • http://www.mde.state.md.us

Parris N. Glendening
Governor

Jane T. Nishida
Secretary

MAR 21 2002

CERTIFIED MAIL: NOTICE OF VIOLATION

Jackson A. Ransohoff, President
Neutron Products, Inc.
22301 Mt. Ephraim Road
P.O. Box 68
Dickerson MD 20842

RE: Radioactive Material License #MD-31-025-01

Dear Mr. Ransohoff:

This letter refers to the radioactive materials inspection conducted by Messrs. Alan Jacobson, Ray Manley, Bob Nelson, and Leon Rachuba of the Maryland Department of the Environment's (MDE) Radiological Health Program (RHP) on December 12 and 13, 2001. The inspection examined radiation safety, compliance with conditions of your license, adherence to procedures and proper maintenance of records, interviews with personnel, general observations, and independent measurements.

During the inspection, the RHP identified poor radioactive waste storage practices and conditions such as waste stored in plastic bags instead of drums and inadequate containment of contamination. In addition, certain activities were found to be in violation of the Department's requirements. The findings were discussed with Messrs. Jeff Williams, Bill Ransohoff, Marvin Turkanis on December 13, 2001. The violations found are listed in the enclosed "Description of Violations."

As a result of these findings, you are required to take immediate action to correct the violations and to respond to this letter and the enclosed "Description of Violations" within twenty (20) calendar days of your receipt of this notice. Written statements should be provided for the concerns and each of the violations indicating:

a. Corrective steps, which have been or will be taken by you to remedy the present violations and the results achieved or anticipated;

b. Corrective steps which will be taken to avoid further violations, who will undertake these steps, and who will supervise them; and

c. The date when full compliance will be achieved.

Failure to provide these statements in the required time frame may result in the Department taking escalated enforcement action under Maryland Radiation Regulations to:

(a) modify, revoke or suspend your license,

(b) issue a Departmental Order under the Annotated Code of Maryland, Environment Article, Sections 1-301 and 8-101 through 8-601, and

(c) seek an administrative penalty of up to $1,000 per violation, per day [Section 8-150(b)], or a civil penalty in Circuit Court in an amount not exceeding $10,000 per violation, per day [Section 8-509(b)].

Please be reminded that Departmental compliance letters and licensee responses shall be posted pursuant to the requirements of the Maryland regulations, Section J.11(d) titled, "Posting of Notices to Workers." If you have any questions concerning this letter, please call Messrs. Alan Jacobson, Carl Trump, Jr., or Raymond E. Manley at (410) 631-3301. You may also reach our office toll-free (in Maryland only) by dialing 1-800-633-6101 and requesting extension 3301. Also, you may contact this office via facsimile at (410) 631-3198.

Sincerely,

Roland G. Fletcher, Program Manager III
Radiological Health Program

RGF/ADJ/cc
ADJ
LET

Enclosures: Description of Violations

DESCRIPTION OF VIOLATIONS

Neutron Products, Inc.
22301 Mt. Ephraim Road
P.O. Box 68
Dickerson MD 20842

RE: Radioactive Material License #MD-31-025-01

Certain activities conducted under your license were found to be in violation of the Code of Maryland Regulations 26.12.01.01 titled, "Regulations for Control of Ionizing Radiation." These violations are presented below:

1. Section C.31 titled, "Specific Terms and Conditions of License" and License Condition 22.B(2) which requires, in part, that all soils, wherever found contaminated by NPI licensed activities and exhibiting levels of cobalt-60 contamination exceeding 8 picocuries per gram above background must be removed by NPI and properly stored/disposed of as radioactive waste.

   Contrary to Section C.31 and License Condition 22.B(2), NPI failed to remove cobalt-60 contaminated soil exceeding the above-specified limit. Specifically, on September 20, 2000 RHP inspectors collected soil samples at sites located both on and off of the NPI facility. Maryland Radiation Laboratory sampling results from these samples indicated that of the 10 samples taken, all indicated soil having cobalt-60 concentrations exceeding 8 picocuries per gram. The range was from 28 – 610 picocuries per gram of soil. NPI failed to remove the contaminated soils from the areas exceeding the license limit. NPI has been in continuous violation of this requirement since May 23, 1989. Furthermore, NPI has still not removed the soil contaminated with cobalt-60 from the adjacent railroad property to establish compliance with the 8.0 picocurie per gram concentration limit. Monthly soil samples collected from the dry pond area and analyzed by NPI personnel in October, November and December 2001 also exceeded the regulatory limit. The Stipulation and Settlement (Civil Case No. 76639 in the Circuit Court of Montgomery County) dated January 3, 1994 required NPI to clean these contaminated areas by June 15, 1994. NPI has missed this deadline and has refused to remediate this property. This is a violation of item 2 of the November 3, 2000 Montgomery County Circuit Court Order.

2. Section D.101 titled, "Radiation Protection Programs" states that in addition to complying with all other provisions of these regulations, a licensee shall use all means to maintain radiation exposures and releases of radioactive material as low as reasonably achievable (ALARA).

   Contrary to Section D.101, the licensee failed to use all means necessary to maintain release of radioactive material as low as reasonably achievable. Specifically, NPI has failed to use means necessary such as the adequate containment of radioactive materials, proper waste storage practices and regular shipments of radioactive waste, to a licensed repository. One only has to review the soil sample results referred to in violation #1 to determine that NPI is not maintaining control over their radioactive material and it is continuing to be released. In spite of curtailed source-manufacturing activities, NPI

continues to release cobalt-60 into the environment in an uncontrolled manner. Contaminated areas of the LAA lack adequate containment and release pathways are not continuously monitored. This is a violation of item 2 of the November 3, 2000 Montgomery County Circuit Court Order.

3. Section C.31 titled, "Specific Terms and Conditions of License" and License Condition 21.B requires that within 90 days of the issuance of the license, NPI must submit to the Department for approval a comprehensive plan for disposal of all low level radioactive wastes in accordance with those specifications defined in this condition.

Contrary to Section C.31 and License Condition 21.B, NPI's low level radioactive waste plan was submitted to MDE on December 10, 1999; however, upon review it was found to be inadequate and as of this date a comprehensive plan acceptable to the Department has not been submitted. Deficiencies in the plan were discussed in a Departmental letter dated March 20, 2000, but NPI has not adequately responded to it. On October 20, 2000 the RHP received NPI's Decommissioning Plan dated October 27, 2000, which included a planned schedule for radioactive waste shipments. The RHP has reviewed this plan and determined that it is inadequate because it does not demonstrate compliance with the current radioactive material license waste disposal criteria. Table 2.1 of this plan describes a 12-year shipment schedule for only a small fraction of the total activity of current radioactive waste inventory. The plan did not describe the shipment schedule and protocol for the disposal of the contaminated soil in storage. All radioactive waste that was generated prior to August 1999 is required to be shipped for disposal by August 2004. NPI has been in continuous violation of this requirement since the November 1999 inspection. This is a violation of the November 3, 2000 Montgomery County Circuit Court Order.

4. Section C.29(c)(2) titled, "Financial Assurance and Recordkeeping for Decommissioning" requires, in part, that each licensee who is a holder of a specific license issued before October 15, 1998 and of a type described in paragraph (a) of C.29 must submit, on or before October 15, 1998 a decommissioning funding plan or a certification of financial assurance for decommissioning in an amount of at least equal to $750,000. Also, the requirements of Section C.29(g)(2) requires that no person shall receive, possess, use, transfer, own, or acquire radioactive material of a type described in paragraphs (a) and (b) of C.29 for more than 180 days following the dates prescribed in the section for submittal of a decommissioning funding plan or certification, if the decommissioning funding plan or certification has not been approved by the Agency.

Contrary to Section C.29(c)(2), NPI has not met the $750,000 certification by the specified dates of this regulation. Furthermore, NPI's decommissioning funding plan has not been approved by the Agency. Pursuant to NPI's failure to provide an adequate decommissioning funding plan or the $750,000 certification by April 13, 1999 (180 days post October 15, 1998) NPI has continued to receive, possess, use, transfer, own, or acquire radioactive material of a type described in paragraphs (a) after the 180 day (April 13, 1999) deadline. NPI has been in continuous violation of this requirement since the November 1999 inspection.

5. Section J.11 titled, "Posting of Notices to Workers" requires, in part, that the licensee post any notice of violation involving radiological working conditions and any response from the licensee.

a. The licensee failed to post the November 3, 2000 Montgomery County Circuit Court "Cease and Desist" Order.

b. The licensee failed to post the December 21, 2000 Montgomery County Circuit Court Order Modifying Permanent Injunction Pending Appeal.

c. The licensee failed to post documents, notices and forms pursuant to J.11(a) in a sufficient number of places to permit individuals engaged in work under the license to observe them on the way to or from any particular work location to which the document applies. Specifically, the licensee failed to post required document near the entrance to the Limited Access Area. According to the October 16, 2001 NPI Letter, page 11, item Q17.1, LAA workers principally use the ground level door, near the underground wastewater holding tank, to report to work. They generally use the walkway between the door and the parking lot. NPI used three boards in other areas of the plant to post required documents. Principally, LAA workers cannot observe required documents as they report to and leave the LAA. These are violations of item 2 of the November 3, 2000 Montgomery County Circuit Court Order.

6. Section D.1101 titled "Records-General Provisions" requires the licensee to use units of becquerel, grey, sievert, coulomb per kilogram, disintegrations per minute, rad, rem and roentgen and clearly indicate the units of all quantities on records required by Part D.

Contrary to the requirements of Section D.1101, the results of soil sample surveys dated June26, 2001, August 28, 2001 and December 5, 2001 were maintained in units of gross counts instead of picocuries. Furthermore, the efficiency of the counting system was not documented on the survey records. As a result, the records did not identify the samples that exceeded the 8.0 picocurie per gram limit. This is a **REPEAT** violation from the June 2001 inspection and a violation of item 2 of the November 3, 2000 Montgomery County Circuit Court Order.

7. Section C.31 titled, "Specific Terms and Conditions of Licenses" and item 1.d. of the November 3, 2000 Montgomery County Circuit Court Order prohibits NPI from receiving, transferring or acquiring any radioactive material except as specifically approved by the Department.

On January 2, 2002 the licensee received a Cobalt-60 source, stored it on the parking lot of NPI's Dickerson facility until January 29, 2002 and then transferred it to a licensed facility in San Antonio, Texas.

8. Section C.31 titled, "Specific Terms and Conditions of Licenses" and License Condition 21(B) prohibits NPI from storing radioactive waste in areas other than the main pool/canals for a period exceeding 2 years.

a. The licensee stored a 12' x 1.5" waste tube containing Argentine cladding from January 2000 to February 2002, a time period greater than 2 years. The licensee has refused to ship this radioactive waste for disposal.

b. The licensee stored approximately 600 cubic feet of soil contaminated with cobalt-60 from November 2000 to February 2002, a time period greater than 2 years. The licensee has refused to ship this radioactive waste for disposal.